CY3271

# PSoC® 1 FirstTouch™ Starter Kit with CyFi™ Low-Power RF Guide

Doc. # 001-48286 Rev. *E

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# 1. Introduction

Thank you for your interest in the CY3271-PSoC 1 FirstTouch™ Starter Kit with CyFi™ Low-Power RF. This kit can be used with the Sense and Control Dashboard (SCD) tool. This kit uses the Cypress 2.4 GHz (ISM band) CyFi Low-Power RF technology to exhibit the simple, power efficient wireless connectivity to embeddded designs; see the CyFi data sheet for more information.

Chapter 2 of this document describes the installation and configuration of the kit software. Chapter 3 explains the programming of a PSoC 1 device with PSoC Programmer and how to use the kit with the help of a code example. Chapter 4 describes the hardware operation. Chapter 5 provides instructions to create a simple project. The Appendix section provides the schematics and bill of materials (BOM) for the kit. The CY3271-PSoC 1 FirstTouch RF (FTRF) Kit is configured with the Multifunction Expansion Card CapSense® Slider code example when shipped. See Chapter 5 for more details. Evaluate the sample projects provided with the kit and then experiment with the kit hardware and software to create your own designs.

## 1.1 Kit Contents

The CY3271-FTRF kit hardware consists of the following components:

- PC bridge (FTPC)
- RF expansion card (FTRF)
- Multifunction expansion card (FTMF)
- AAA power pack (AAA)
- CR2032 power pack (CR2032)
- CY8C20634-12FDXI sample silicon
- CY3271-FTRF kit CD/DVD
  - PSoC Designer installation file
  - PSoC Programmer installation file
  - Bridge Control Panel installation file (packaged along with PSoC Programmer)
  - Code examples
  - Hardware files
  - Kit guide
  - Quick start guide
  - Release notes

Inspect the contents of the kit. If any parts are missing, contact your nearest Cypress sales office for further assistance.

## 1.2 Sense and Control Dashboard

SCD enables to log data and monitor wired and wireless sensors created using PSoC 1. The features include data logging, calibration, alarms, and data aggregation from hundreds of sensors. In the CY3271, SCD is used to log data from wireless sensors connected to the PC, using the FTRF.

## 1.3 Additional Learning Resources

Visit www.cypress.com for additional learning resources in the form of data sheets, technical reference manual, and application notes.

- Application Note - Features and Performance of a Wide Array of PSoC Analog-to-Digital Converters: http://www.cypress.com/?rID=2641
- PSoC CY8C21434 - Chip Features and Functional Overview: http://www.cypress.com/?rID=3345
- PSoC CY8C27443 - Chip Features and Functional Overview: http://www.cypress.com/?rID=3324
- For more information regarding PSoC Designer functionality and releases: www.cypress.com/go/psocdesigner
- For more information regarding PSoC Programmer, supported hardware and COM layer: www.cypress.com/go/psocprogrammer
- For a list of PSoC Designer-related trainings: http://www.cypress.com/?rID=40543

## 1.4 Document History

| Revision | PDF Creation Date | Origin of Change | Description of Change |
|---|---|---|---|
| ** | 10/17/2008 | VED | Initial version of kit guide |
| *A | 05/04/2010 | SHEA | CDT based updates |
| *B | 01/31/2011 | RKPM | Extensive content updates |
| *C | 07/08/2011 | RKPM | Added My First Code Example section. Text and image updates throughout the document |
| *D | 09//21/2011 | RKPM | Updated section 2.4 Configuring Sense and Control Dashboard. Minor content updates. |
| *E | 05/01/2013 | ELIN | No technical updates. Completing Sunset Review. |

## 1.5 Documentation Conventions

Table 1-1. Document Conventions for Guides

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

# 2. Getting Started

This chapter describes how to install and configure the CY3271-PSoC 1 FirstTouch RF (FTRF) kit.

## 2.1 Kit Installation

To install the kit software, follow these steps:

1. Insert the kit CD/DVD into the CD/DVD drive of your PC. The CD/DVD is designed to auto-run and the kit installer startup screen appears.

   **Note** You can also download the latest installer from http://www.cypress.com/go/CY3271-FTRF. Three different types of installers are available for download:

   a. CY3271-FTRF_ISO: This file (ISO image) is an archive file of the optical disc provided with the kit. You can use this to create an installer CD/DVD or extract information using WinRar or similar tools.

   b. CY3271-FTRF_Single Package: This executable file installs the CD/DVD contents, which includes PSoC Programmer, PSoC Designer, code examples, kit hardware files, and user documents.

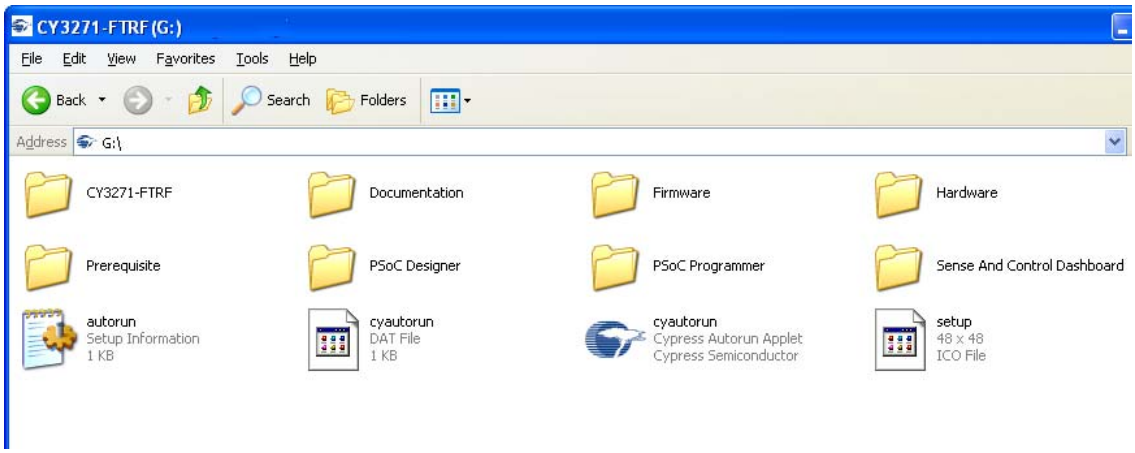
   c. CY3271-FTRF_Single Package (without prerequisites): This executable file installs only the kit contents, which includes kit code examples, hardware files, and user documents.

2. Click **Install CY3271-FTRF Kit** to start the installation, as shown in Figure 2-1.

   Figure 2-1. Kit Installer Startup Screen

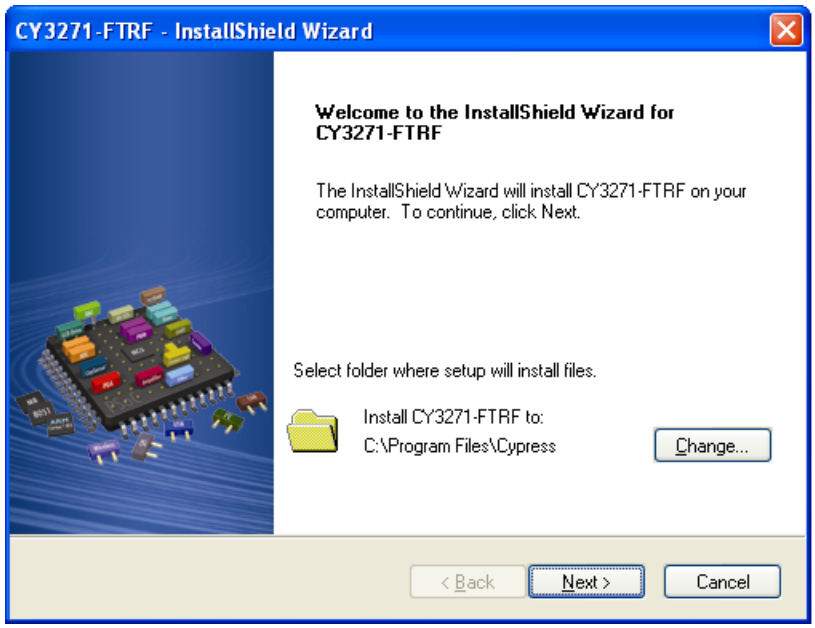
**Note** If auto-run does not execute, double-click *cyautorun.exe* file on the root directory of the CD/DVD, as shown in Figure 2-2.

Figure 2-2. Root Directory of CD/DVD



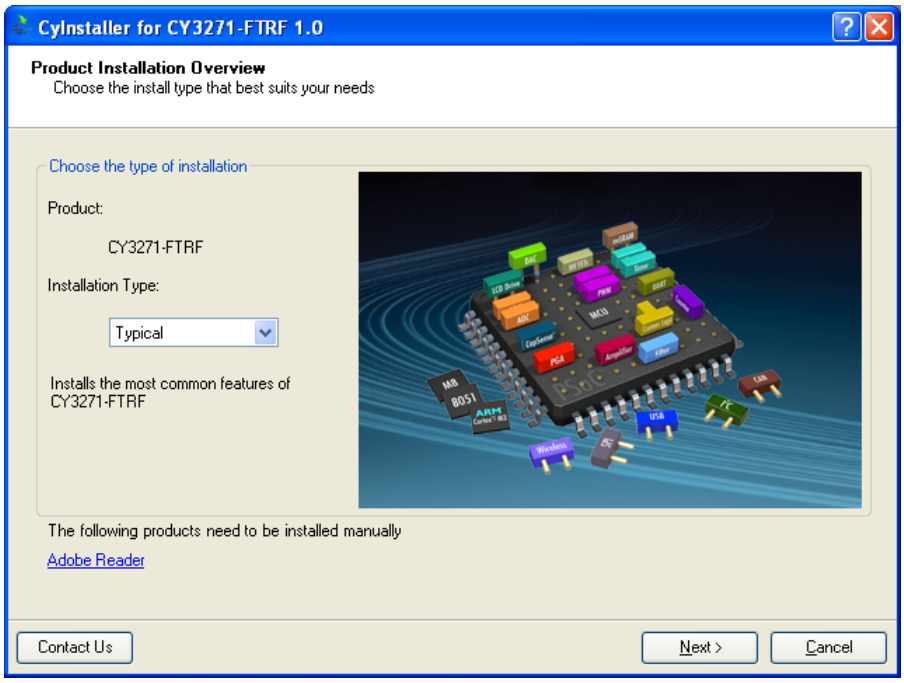

3. The **InstallShield Wizard** screen appears. On this screen, choose the folder location to install the setup files. You can change the location of the folder for the setup files using **Change**, as shown in Figure 2-3.
4. Click **Next** to launch the kit installer.

Figure 2-3. InstallShield Wizard



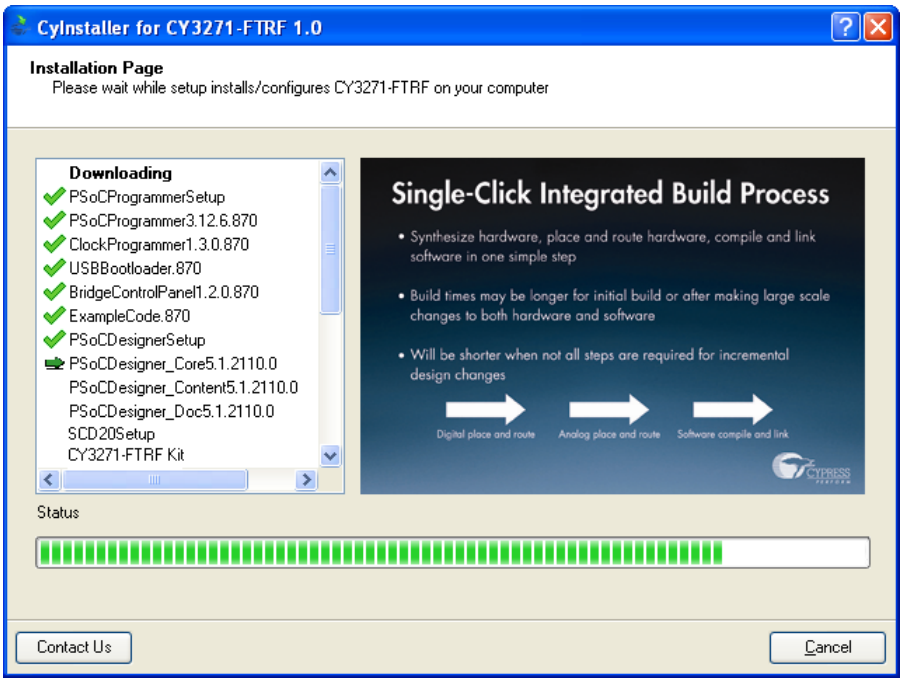

5. On the **Product Installation Overview** screen, select the installation type that best suits your requirement. The drop-down menu has three options - **Typical, Custom,** and **Complete**, as shown in Figure 2-4.
6. Click **Next** to start the installation.

Figure 2-4. Installation Type Options



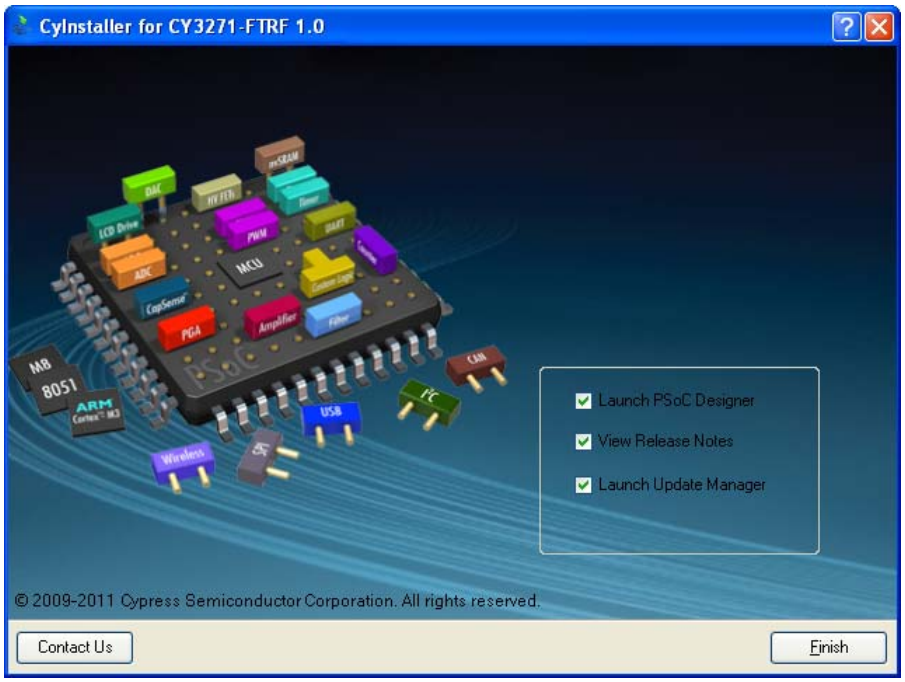

7. When the installation begins, a list of packages appears on the **Installation Page**. A green check mark appears adjacent to every package that is downloaded and installed; see Figure 2-5.
8. Wait until all the packages are downloaded and installed successfully.

Figure 2-5. Installation Page




9. Click **Finish** to complete the installation, as shown in Figure 2-6.

Figure 2-6. Installation Complete



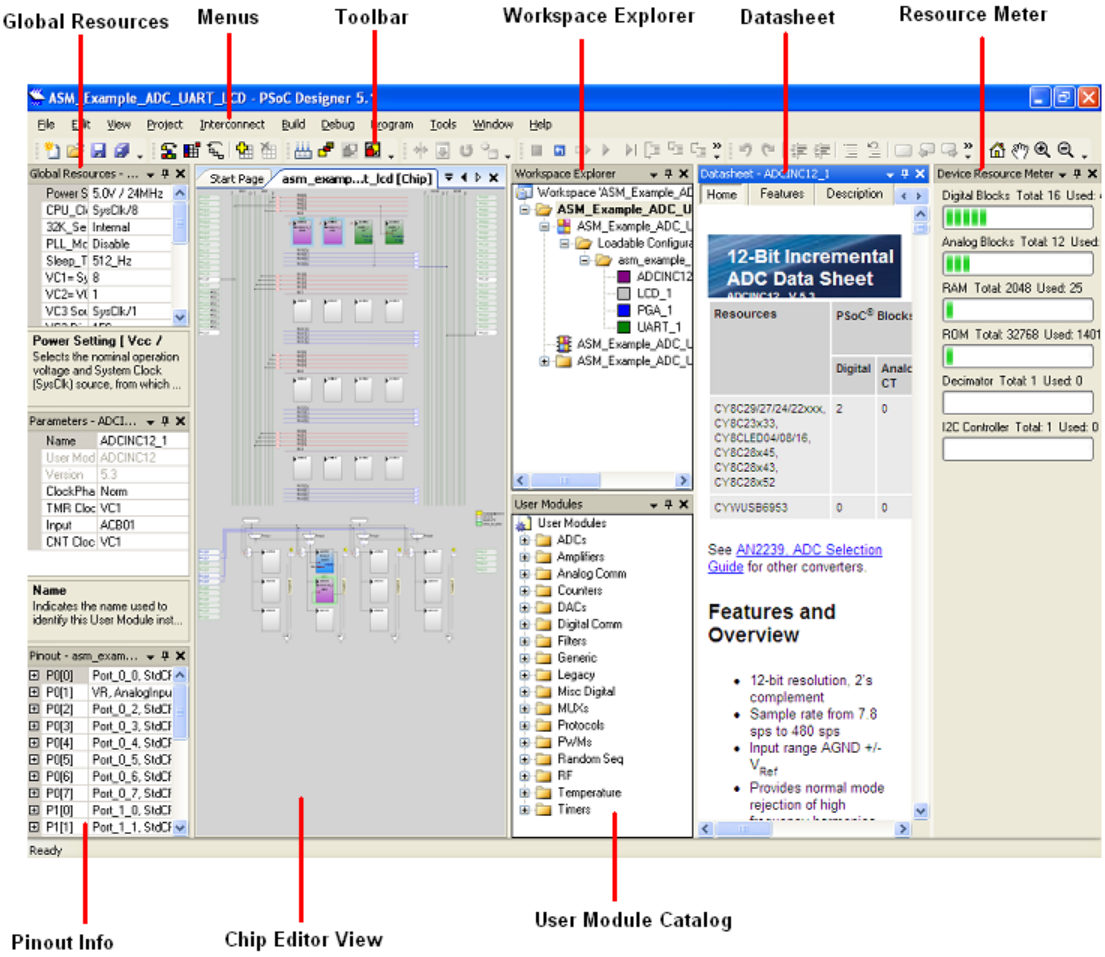

After software installation, verify that you have all hardware and drivers set up for the CY3271-FTRF kit by connecting the kit to your PC via its USB interface. Because this is the first time you have connected this board to the PC, initial drivers are installed. Follow the instructions for USB detection to complete the installation process. Now, verify your installation and setup by opening PSoC Programmer with the kit board attached.

**Note** Advanced users can go to Code Examples on page 41.

## 2.2 PSoC Designer

1. Click **Start > All Programs > Cypress > PSoC Designer <version> > PSoC Designer <version>**.
2. Click **File > New Project**, to create a new project; click **File > Open Project** to work with an existing project.

   Figure 2-7. PSoC Designer Interconnect View




3. To experiment with the code examples, go to Code Examples on page 41.

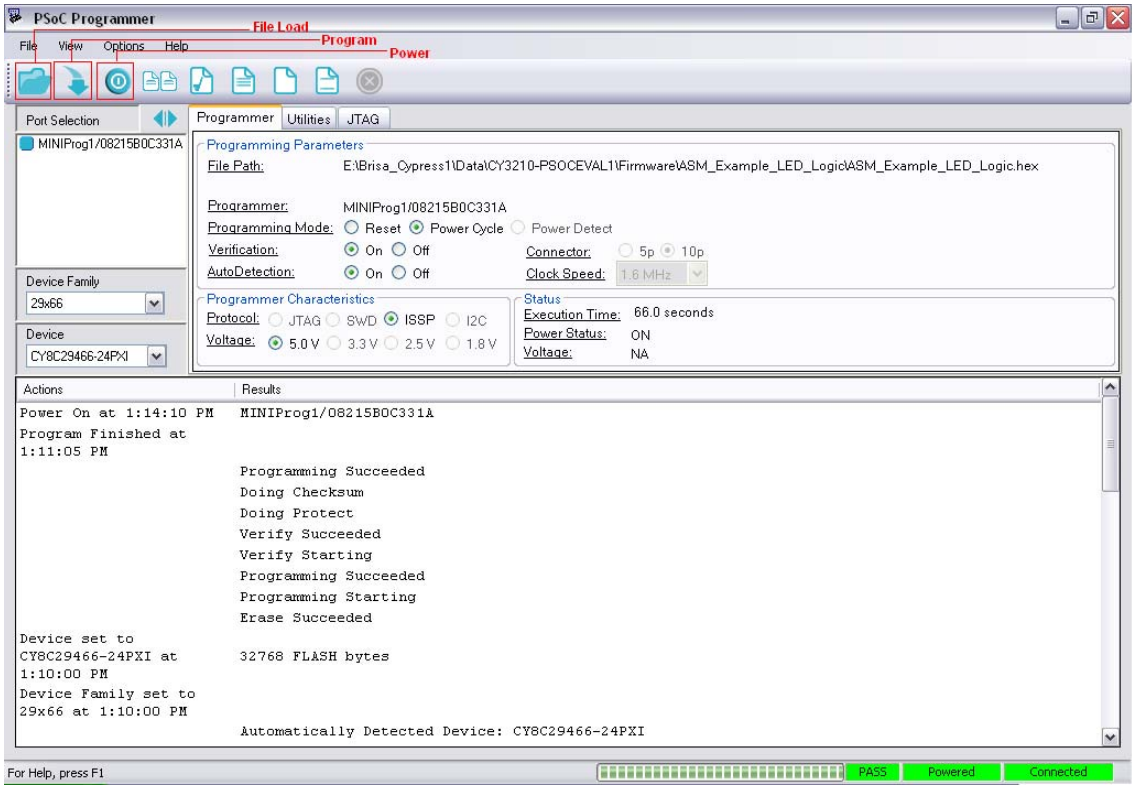
**Note** For more details on PSoC Designer, see the PSoC Designer IDE Guide located at: `<Install_Directory>:\Cypress\PSoC Designer\<version>\Documentation.`

See Additional Learning Resources on page 6 for links to PSoC Designer training. The PSoC Designer quick start guide is available at: http://www.cypress.com/?rID=47954.

## 2.3 PSoC Programmer

1. Click **Start > All Programs > Cypress > PSoC Programmer <version> > PSoC Programmer <version>**.
2. Select the MiniProg from Port Selection, as shown in Figure 2-8.

Figure 2-8. PSoC Programmer Window



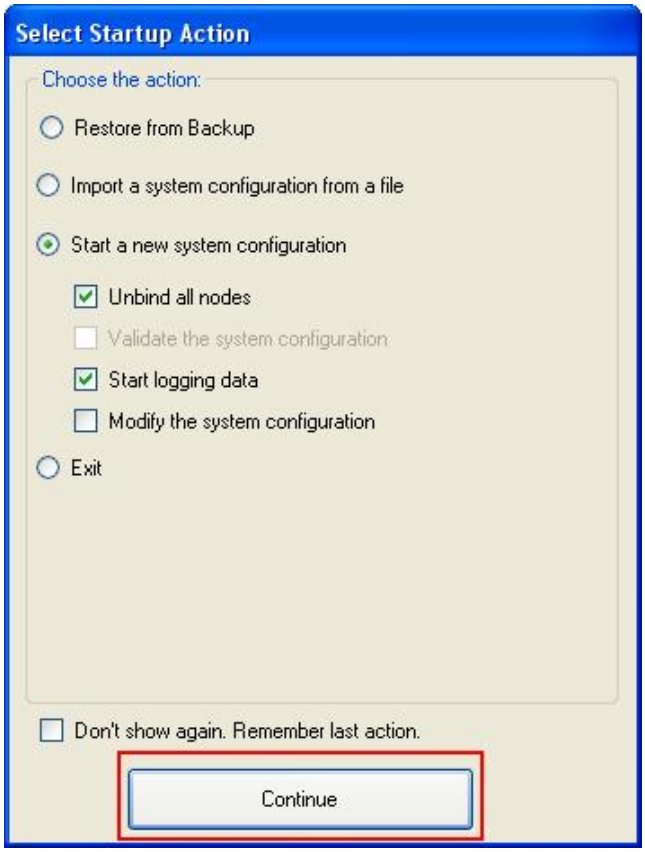

3. Click **File Load** to load the hex file.
4. Use the **Program** button to program the hex file on to the chip.
5. When programming is successful, **Programming Succeeded** appears in the Actions pane.
6. Close PSoC Programmer.

**Note** For more details on PSoC Programmer, see the user guide at the following location: `<Install_Directory>:\Program Files\Cypress\Programmer\<version>\Documents`.

## 2.4 Configuring Sense and Control Dashboard

1. Click **Start > All Programs > Cypress > Sense and Control Dashboard <version> > Sense and Control Dashboard <version>** to open the SCD software.
2. Select **Startup Action** window; select the options **Start new system configuration**, **Unbind all nodes**, and **Start logging data**; click **Continue**.

Figure 2-9. Startup Action Window

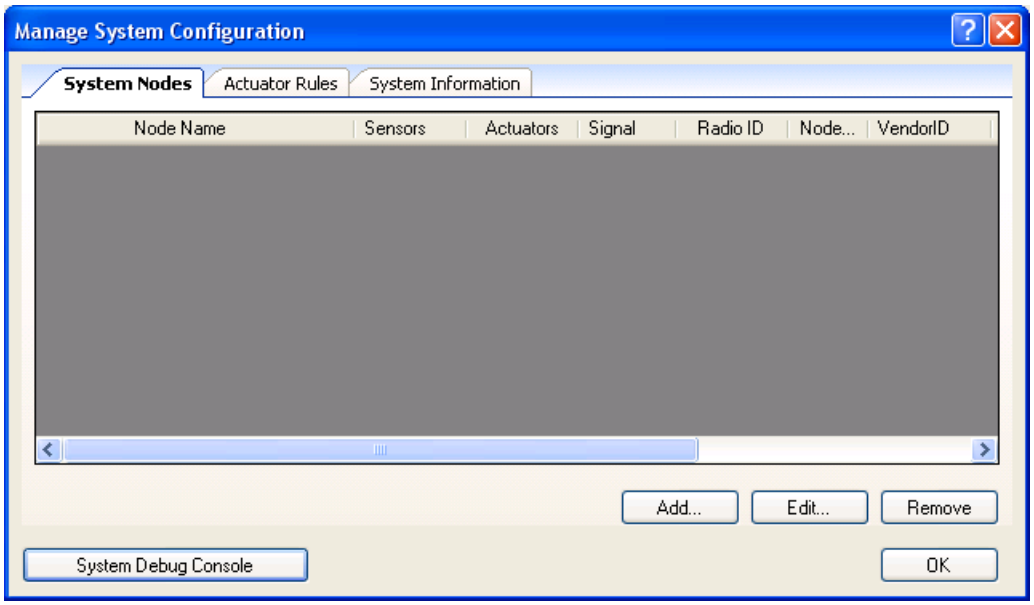


3. Select a location to save the configuration file (SDF).
4. Connect the PC Bridge (FTPC) USB dongle on to a free USB port in the PC.
5. Connect the Multifunction board to the RF Bridge board. Power up this assembly using the AAA power pack board provided with the kit.
6. Attach a node to the wireless hub and configure the SCD to view the node data; to do this, follow these instructions.
7. Click the **Manage** button to add a new node, as shown in Figure 2-10.

Figure 2-10. Manage Button in SCD Dashboard

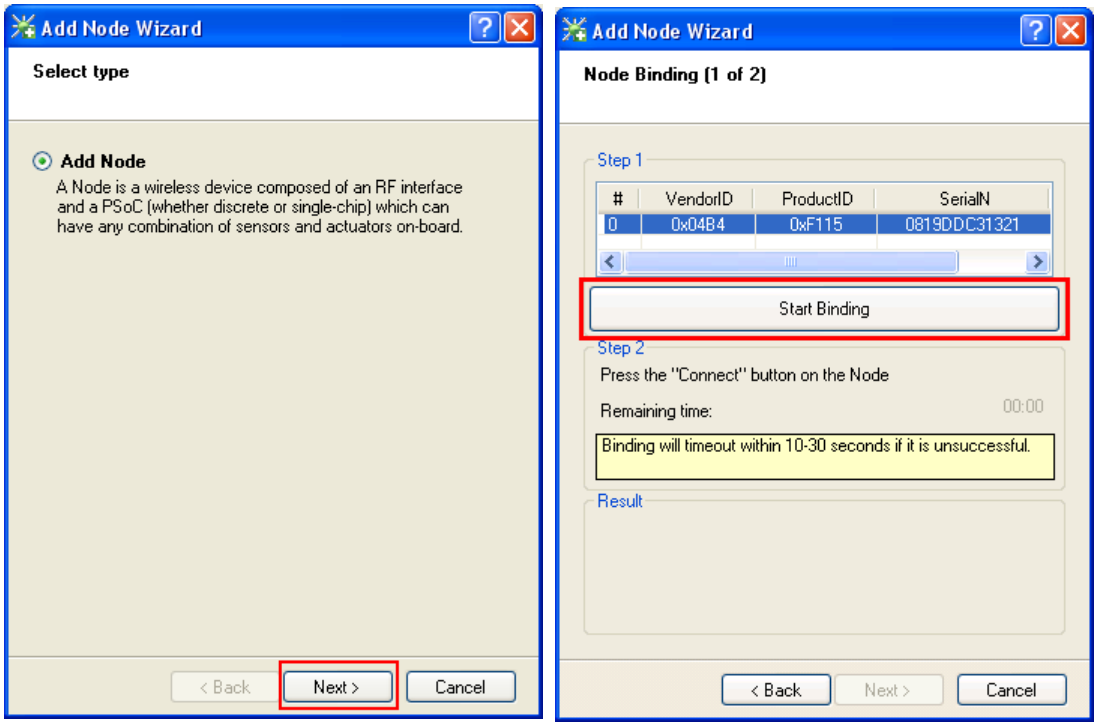

8. In the Manage System Configuration screen, click **Add**.

Figure 2-11. Manage System Configuration - Add




9. The Add Node Wizard opens up; Select the **Add Node** option and click **Next** in the Add Node Wizard; then, click on **Start Binding** in the subsequent window.

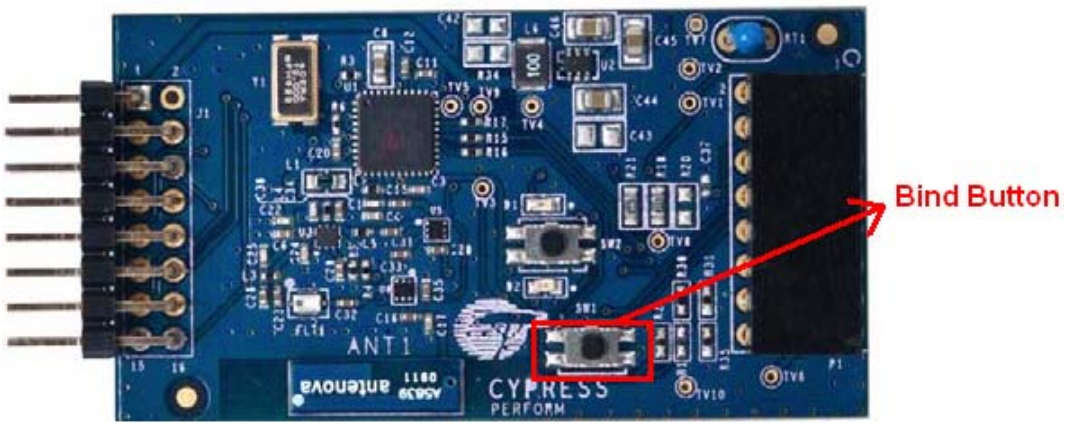
Figure 2-12. Add Node and Start Binding




10. Press the **Bind** button on the RF Bridge board; this ensures that the node is in Bind mode and allows the hub to discover the node.

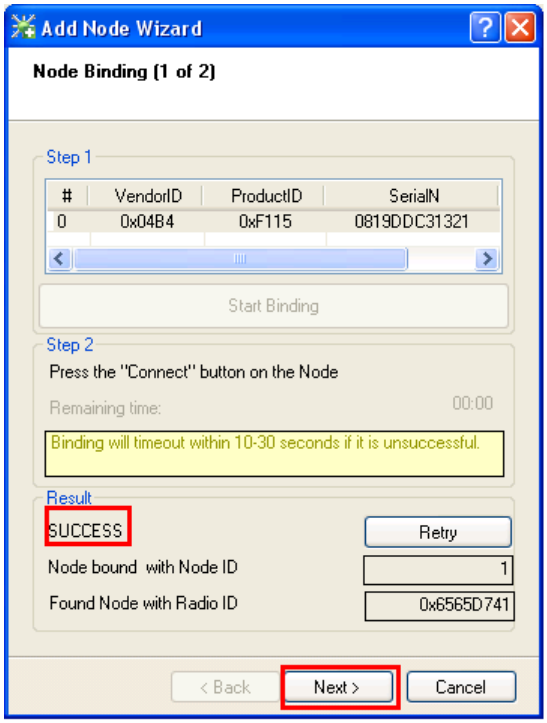
    **Note** Press the Bind button within 30 secs of pressing the button on the GUI; otherwise, binding does not occur and the result is shown as 'Time out'.

    Figure 2-13. Bind Button



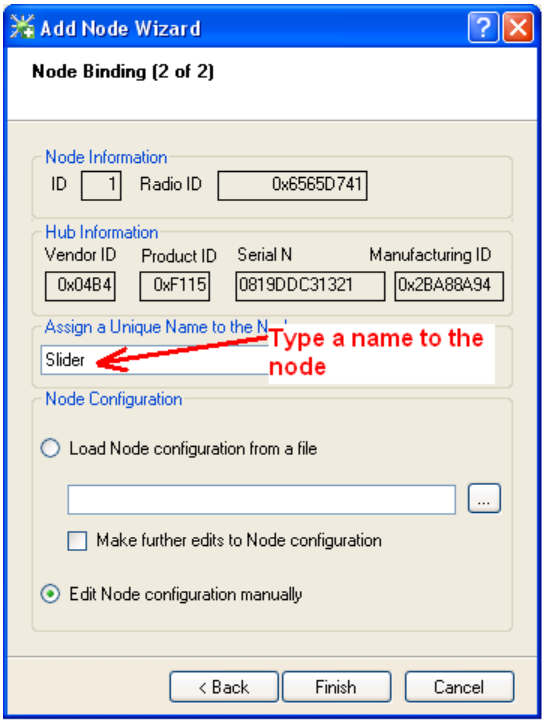

11. Verify the success of the bind and click **Next.**

Figure 2-14. Successful Bind



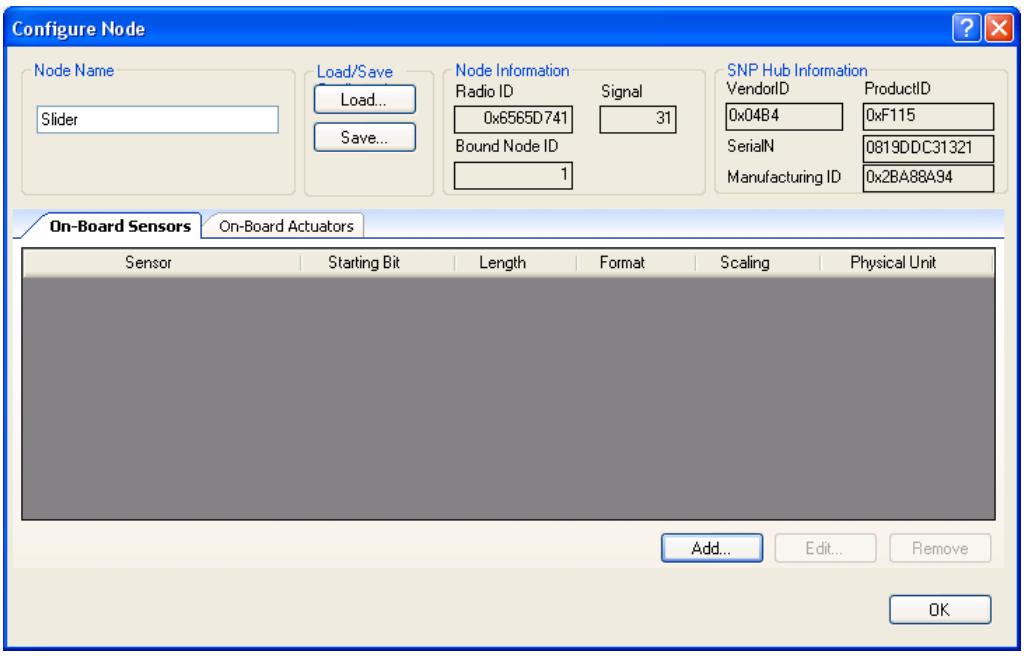

12. On the next screen, assign a name to the node.

Figure 2-15. Enter Node Name



13. In the Node Configuration section, the option **Edit Node Configuration manually** is selected by default. For this kit, the node configuration is completed and stored as xml files. On successful binding of the node, choose **Load Node Configuration** from a file option and select the appropriate xml file from `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Firmware\DeviceTemplates.` Click **Finish**.
14. To edit the node manually, select **Edit Node Configuration manually** and click **Finish**.
15. Click **Add** on the **Configure Node** screen to configure the sensor parameters.

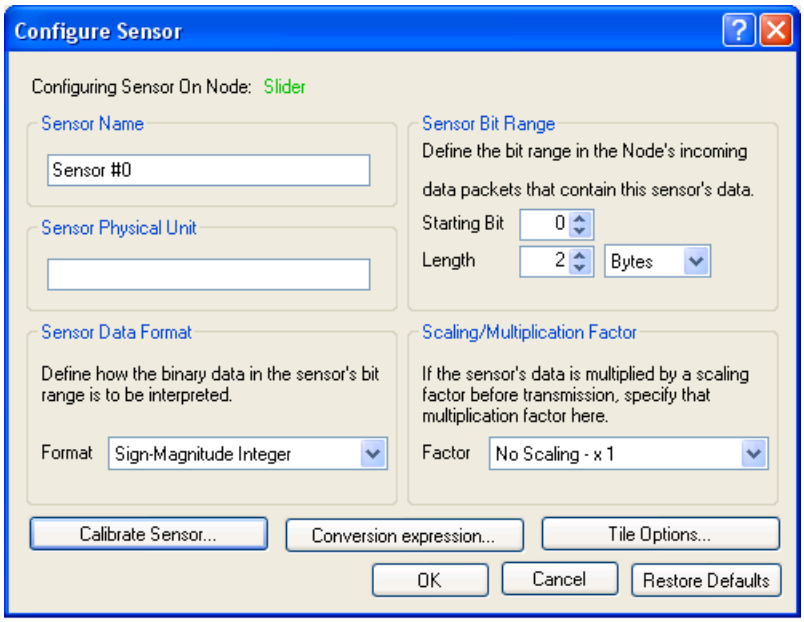
Figure 2-16. Configure Sensor Parameters




16. The Configure Sensor window opens up. The following parameters can be configured for the sensor:
    a. Sensor Data Format - Unsigner Integer, Two's Complement Integer, and so on
    b. Senor Bit Range
    c. Data Length - Bits or Bytes
    d. Scaling/Multiplication Factor (if any)
    e. Sensor Physical Unit - KPa, Lux, and so on. This is used in the graphical display of node data.

    **Note** Figure 2-17 shows the default values.

Figure 2-17. Configure Sensor Parameters




17. The SCD GUI provides the options to calibrate the sensor, specify the conversion expression, and display options (Tile options). Click on the respective buttons to enter the context specific menus and options.
18. After configuring the node, click **OK** on all subsequent screens to return to the main screen where the data logging has started.
19. Configuring the sensor can even be done at a later time by clicking on the appropriate button in the main menu

Figure 2-18. Main Menu Buttons

# 3. Kit Operation

## 3.1 Introduction

The CY3271-FTRF kit examples help you develop applications using the PSoC 1 family of devices. The kit is designed to develop analog applications using PSoC 1. Being a development platform, the board also has test points to enable low power measurements for low power application development and evaluation.

The kit components are shown in the following figures.

Figure 3-1. PC Bridge (Dongle)

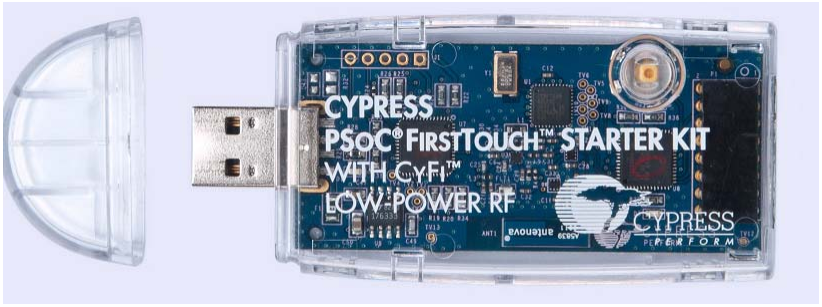



Figure 3-2. RF Expansion Card (FTRF)

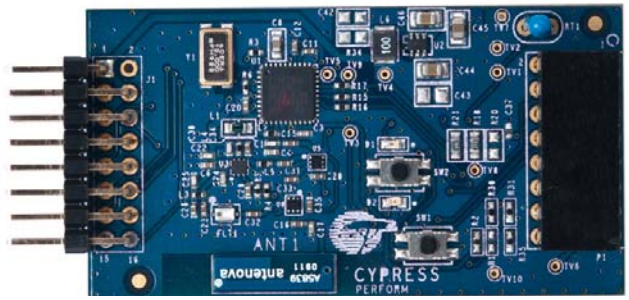



Figure 3-3. Multifunction Expansion Card (FTMF)

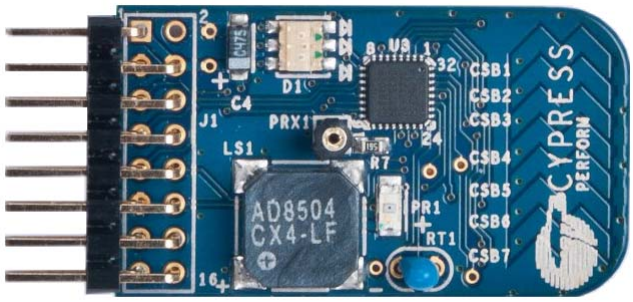


Figure 3-4. AAA Battery Pack

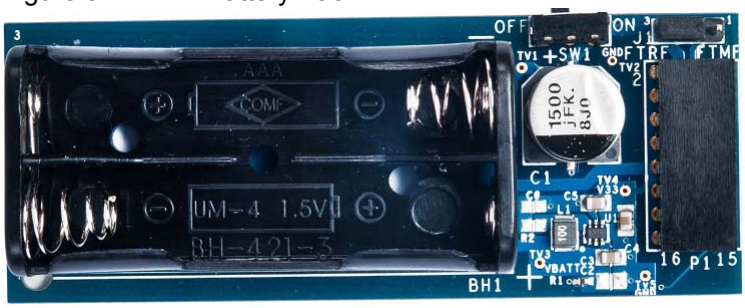
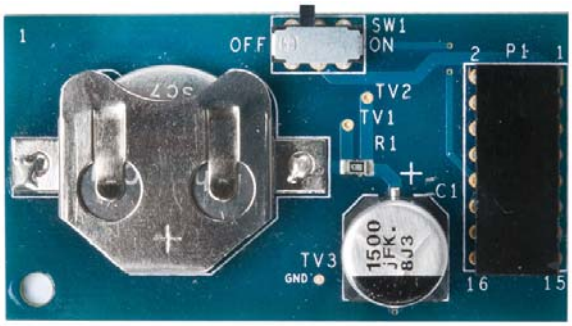



Figure 3-5. Coin Battery




## 3.1.1 RF Expansion Card

### *3.1.1.1 Connecting RF Expansion Card Using PC Bridge*

The CY3271-FTRF Kit uses a PSoC CY8C27443 on the RF expansion board. Because the FTRF expansion card has its own PSoC 1, connect the RF expansion card to the PC bridge. The USB port of the bridge is then connected to the PC. The PSoC 1 on the RF expansion board can be programmed using the PC bridge.

### *3.1.1.2 Programming FTRF*

The RF expansion card can be programmed using PSoC Programmer, by programming the hex file on to the chip using PC bridge.

When using on-board programming, it is not necessary to power the board from the 9-V DC supply or a battery. The USB power to the programming section can power the board.

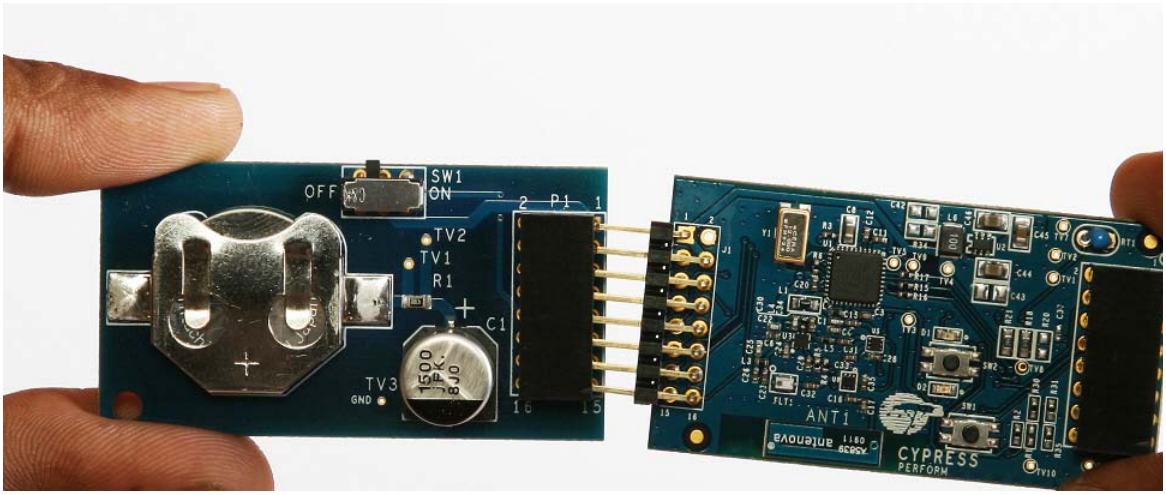
### *3.1.1.3 Working with FTRF*

The project files are located in the firmware directory. After installation, firmware projects are available at `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Firmware.`

Figure 3-6. Connect FTRF to AAA Batteries


FTRF can be connected to AAA power pack for power, or with CR2032 power pack for ultra low-power applications, as shown in Figure 3-6 and Figure 3-7, respectively.

Figure 3-7. Connect FTRF to CR2032 Batteries

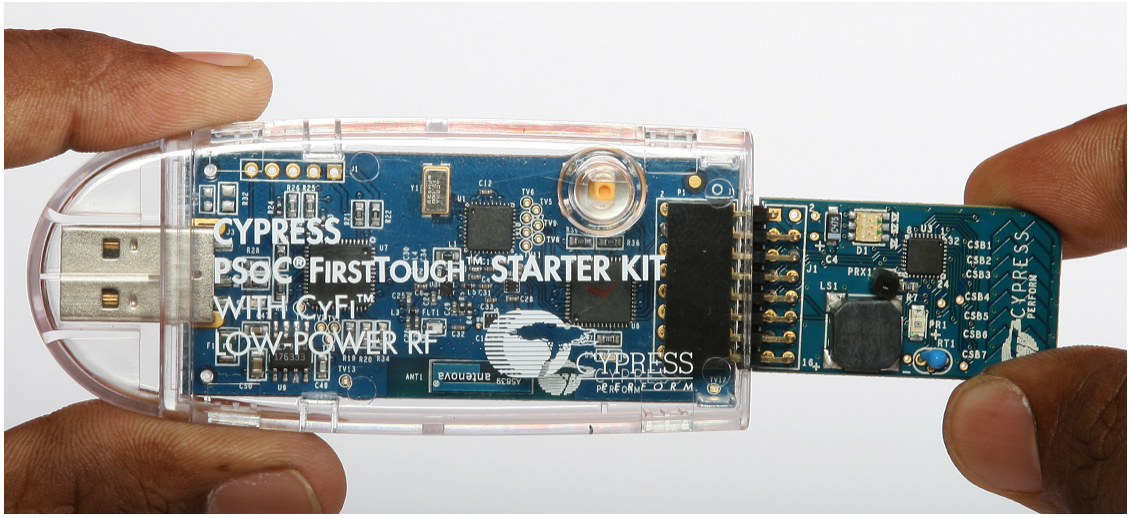


## 3.1.2 Multifunction Expansion Card

### *3.1.2.1 Connecting FTMF*

*3.1.2.2* FTMF card is connected to the PC bridge, as shown in Figure 3-8.

Figure 3-8. Connect Multifiuction Expansion Card to PC Bridge




### *3.1.2.3 Programming FTMF*

FTMF is programmed using PC bridge; power supply to the card is via USB. PSoC Programmer is used to write the hex file on to the FTMF card.

### *3.1.2.4 Working with FTMF*

The project files are located in the firmware directory. FTMF can be powered using the CR2032 power pack. After installation firmware projects are available at `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Firmware.`

**Note** When powering the board via an external power source, ensure that the battery board is plugged in with the power supply connected to the empty battery terminal leads.

# 4. Hardware

## 4.1 System Block Diagram

The PSoC 1 FirstTouch Starter Kit with CyFi low-power RF has the following contents:

- PC Bridge
- RF Expansion Card
- Multifunction Card
- AAA Power Pack
- CR2032 Power Pack

## 4.2 Functional Description

Figure 4-1. PC Bridge.

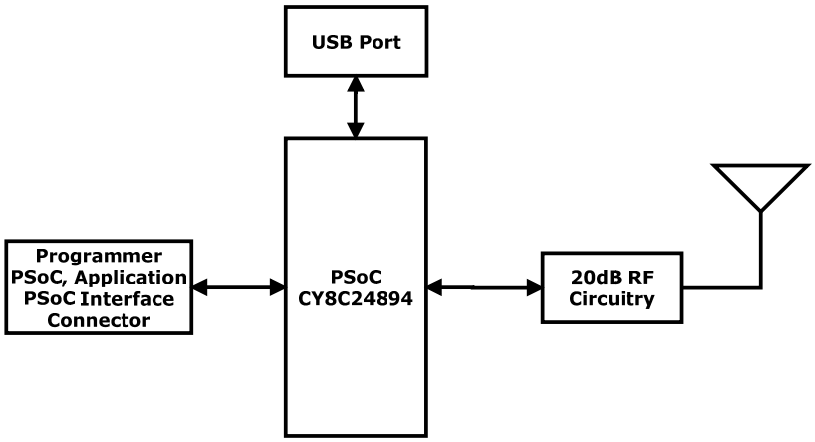


Figure 4-2. RF Expansion Board

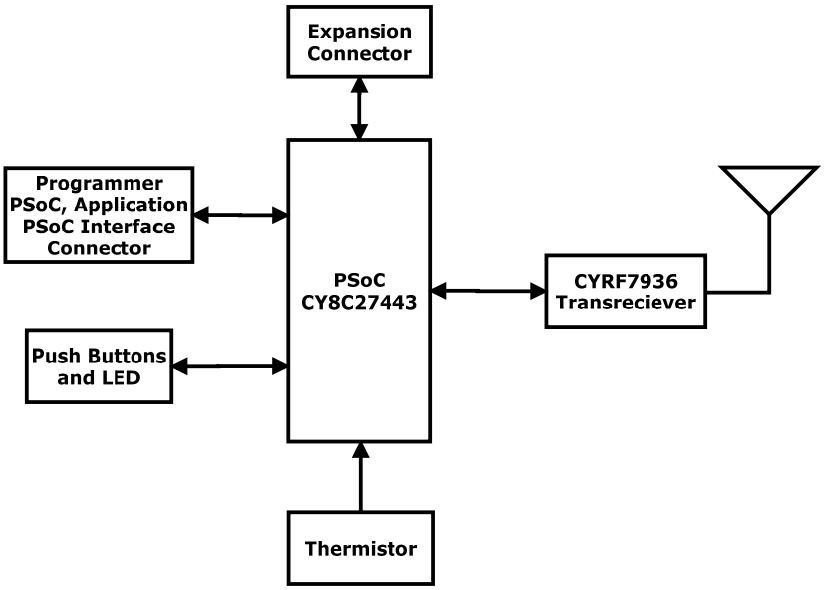



Figure 4-3. Multifunction Board

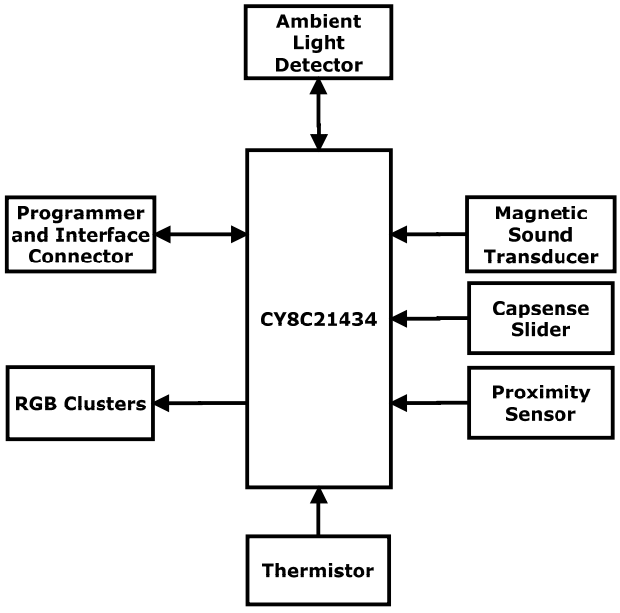


Figure 4-4. AAA Battery Block Diagram

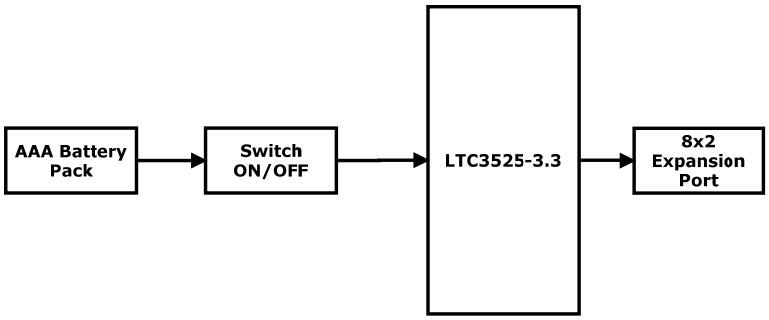



Figure 4-5. Coin Cell Battery Block Diagram


## 4.2.1 FirstTouch PC Bridge (FTPC)

The PC bridge consists of the hub CY8C24894, the master CY8C24894, and the CYRF7936 2.4 GHz CyFi transceiver. It contains a 16-pin connector to connect to the RF expansion board or the multifunction board, for application data exchange or ISSP programming. The FTPC bridge is the interface bridge between the expansion card, the PC, and the various applications.

Because the FTPC bridge enumerates as a special type of 'composite device' that contains a PSoC MiniProg interface, the standard PSoC Programmer utility can identify and communicate with the FTPC bridge. This ensures that your FTRF kit is automatically compatible with PSoC Designer.

**Note** When using the FTPC bridge to program a target board with the CY8C24894 device (for example, the Weather Station board in the CY3271-EXP1 Kit), ensure that the target board is connected to the FTPC while programming. Otherwise, the FTPC programs its own CY8C24894 device.

### *4.2.1.1 CYRF7936 Transceiver*

The CYRF7936 CyFi transceiver is a radio IC designed for low power embedded wireless applications. It can be used only with Cypress's PSoC programmable system-on-chip. Combined with the PSoC 1 and a CyFi network protocol stack, CYRF7936 can be used to implement a complete CyFi wireless system.

The CYRF7936 IC is designed to implement wireless device links operating in the worldwide 2.4-GHz ISM frequency band.

In addition, the CYRF7936 IC has a power management unit (PMU), which allows direct connection of the device to any battery voltage in the range 1.8 V to 3.6 V.

The CYRF7936 contains a 2.4-GHz CyFi radio modem, which features a 1-Mbps GFSK radio front-end, packet data buffering, packet framer, DSSS baseband controller, and RSSI. CYRF7936 features a SPI interface for data transfer and device configuration, as shown in Figure 4-6.

Figure 4-6. CYRF7936 Transceiver

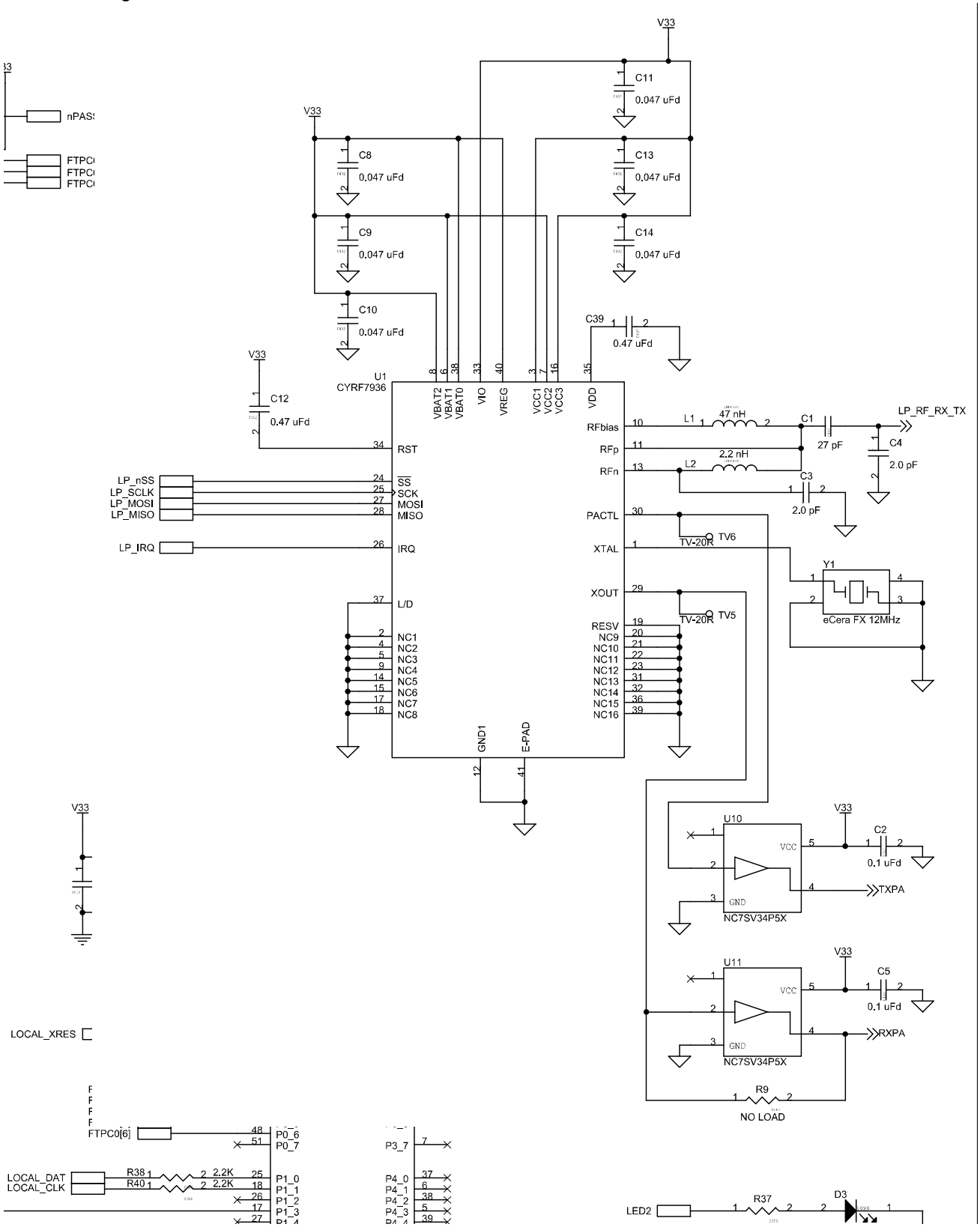


Figure 4-7. CY8C24894 Master Chip Schematic

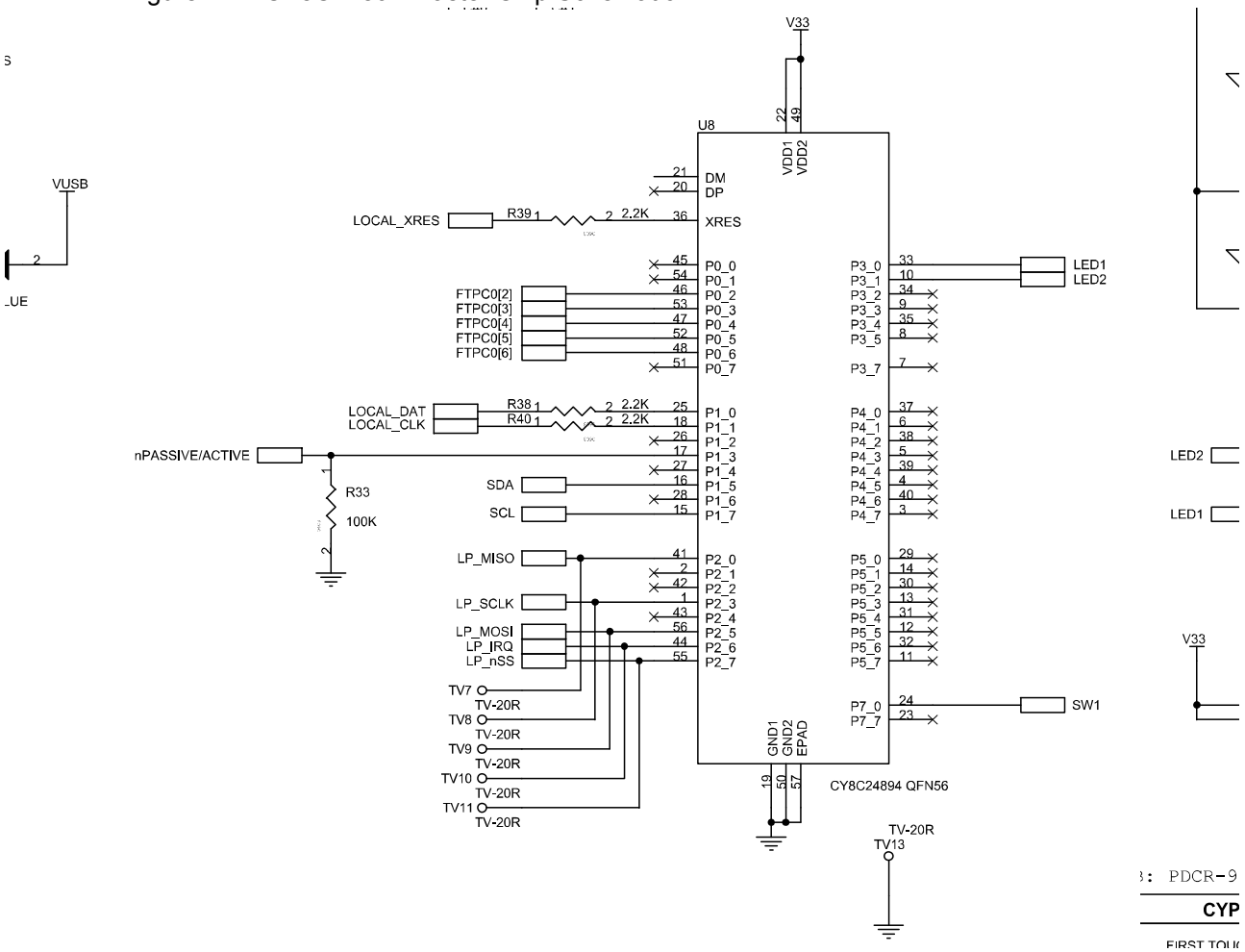



Table 4-1. CY8C24894 Port Connectivity

| Pin No. | Port No. | Description | Connected To |
|---|---|---|---|
| 1 | P2[3] | Direct switched capacitor block input | LP_SCLK,TV8 |
| 2 | P2[1] | Direct switched capacitor block input | |
| 3 | P4[7] | | |
| 4 | P4[5] | | |
| 5 | P4[3] | | |
| 6 | P4[1] | | |
| 7 | P3[7] | | |
| 8 | P3[5] | | |
| 9 | P3[3] | | |
| 10 | P3[1] | LED2 | LED2 |
| 11 | P5[7] | | |
| 12 | P5[5] | | |
| 13 | P5[3] | | |
| 14 | P5[1] | | |
| 15 | p1[7] | I2C Serial Clock (SCL). | SCL |

Table 4-1. CY8C24894 Port Connectivity *(continued)*

| Pin No. | Port No. | Description | Connected To |
|---|---|---|---|
| 16 | P1[5] | I2C Serial Data (SDA). | SDA |
| 17 | P1[3] | | nPASSIVE/ACTIVE |
| 18 | P1[1] | I2C Serial Clock (SCL), ISSP SCLK*. | LOCAL_CLK |
| 19 | Vss | Ground connection. | GND1 |
| 20 | D+ | | DP |
| 21 | D- | | DM |
| 22 | Vdd | Supply voltage. | Vdd1 |
| 23 | P7[7] | | |
| 24 | P7[0] | | SW1 |
| 25 | P1[0] | I2C Serial Data (SDA), ISSP SDATA*. | LOCAL_DAT |
| 26 | P1[2] | | |
| 27 | P1[4] | | |
| 28 | P1[6] | | |
| 29 | P5[0] | | TV1 |
| 30 | P5[2] | | TV2 |
| 31 | P5[4] | | TV3 |
| 32 | P5[6] | | TV4 |
| 33 | P3[0] | LED1 | LED1 |
| 34 | P3[2] | | |
| 35 | P3[4] | | |
| 36 | XRES | Active high external reset with internal pull down. | LOCAL_XRES |
| 37 | P4[0] | | |
| 38 | P4[2] | | |
| 39 | P4[4] | | |
| 40 | P4[6] | | |
| 41 | P2[0] | Direct switched capacitor block input. | LP_MISO,TV7 |
| 42 | P2[2] | Direct switched capacitor block input. | |
| 43 | P2[4] | External Analog Ground (AGND) input | |
| 44 | P2[6] | External Voltage Reference (VREF) input. | LP_IRQ,TV10 |
| 45 | P0[0] | Analog column mux input. | |
| 46 | P0[2] | Analog column mux input. | FTPC0[2] |
| 47 | P0[4] | Analog column mux input VREF. | FTPC0[4] |
| 48 | P0[6] | Analog column mux input. | FTPC0[6] |
| 49 | Vdd | Supply voltage. | Vdd2 |
| 50 | Vss | Ground connection. | GND2 |
| 51 | P0[7] | Analog column mux input,. | |
| 52 | P0[5] | Analog column mux input and column output. | FTPC0[5] |
| 53 | P0[3] | Analog column mux input and column output. | FTPC0[3] |
| 54 | P0[1] | Analog column mux input. | |
| 55 | P2[7] | | LP_nSS,TV11 |
| 56 | P2[5] | | LP_MOSI,TV9 |
| 57 | EPAD | | EPAD |

The master CY8C24894 (Figure 4-4) also acts as a programmer and downloads the firmware hex file on to the application CY8C24894.

### 4.2.2 Programming PC Bridge Application Processor

Select **FirstTouch RF** from the list of programmer devices and then choose the hex file to program the application processor. Make sure that there are no expansion cards connected to the expansion connector.

## 4.3 RF Expansion Card Overview

### 4.3.1 RF Expansion Card

The RF expansion card acts as the node device. It contains the PSoC CY8C27443, which is the application MCU that controls the radio transceiver CYRF7936 and sensors. The RF expansion board also contains the onboard thermistor.

The RF expansion card is designed to plug and play with the FTPC bridge. All power for the included expansion cards is provided by either the AA or the coin cell battery packs. Connect the FTPC expansion port through the 8×2 pin header on the expansion card. The FirstTouch expansion cards have a dedicated host PSoC 1 device installed. The particular PSoC installed is chosen as an example to indicate which PSoC 1 is most suitable for the types of applications supported by a particular expansion card. This also makes it easier to transfer your design from the CY3271-FTRF kit to your hardware.

**Note** When powering the board via an external power source, ensure that the battery board is plugged in with the power supply connected to the empty battery terminal leads.

#### *4.3.1.1 Application PSoC 1 (CY8C27443)*

Port P1[0] and P1[1] are connected to ISSP DAT and ISSP CLK, respectively. Two LEDs are driven by P1[2] and P1[3]. P1[5] and P1[7] are used to drive I2C SDA and I2C SCL, respectively. Port P0[0] is used to sense temperature “VTEMP” (temperature sensor output voltage). P0[1] to P0[6] are general purpose I/O ports. It acts as a master to control other devices connected to P0[2] and P0[4]. P1[4] is used as External Clock Input. P1[6] is used as output connect.P2[6] is used as External Voltage Reference (VRef), and P2[4] is used as External Analog Ground.

Figure 4-8. Application PSoC 1 Chip

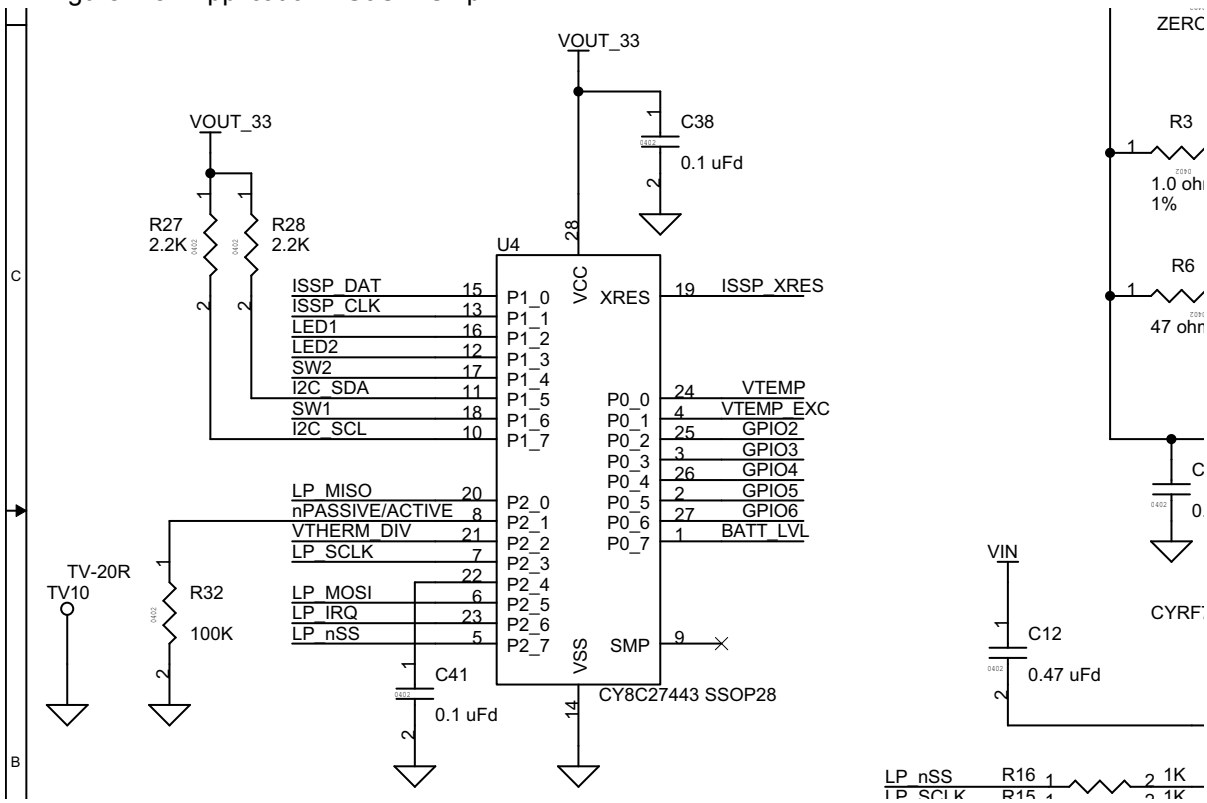



Figure 4-9. Push Buttons Schematic

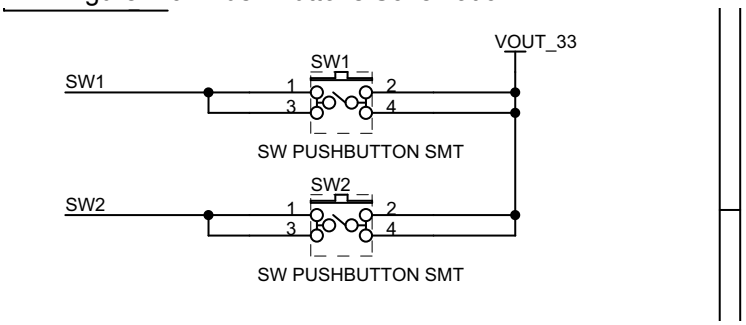
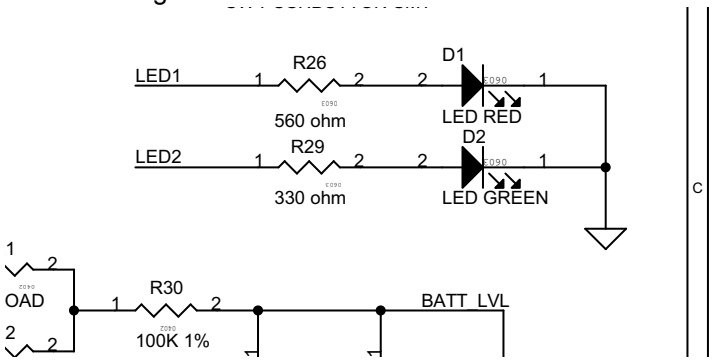


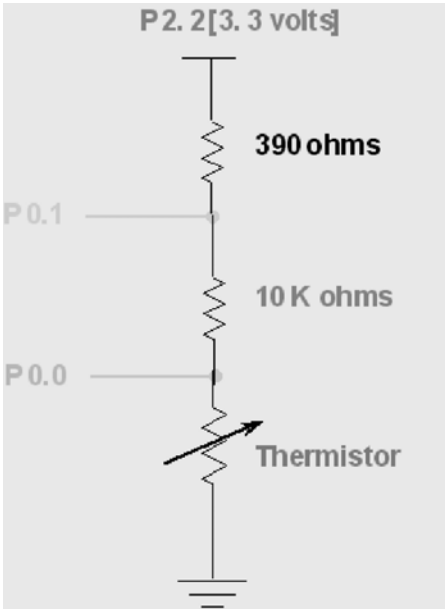

Figure 4-10. LED Schematic



### 4.3.2 Hardware Design

The following figure shows the hardware design for a temperature sensor design using a thermistor.

Figure 4-11. Hardware Design



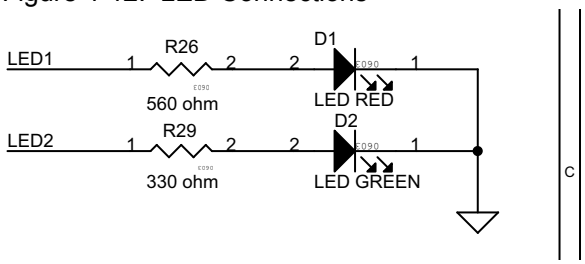

In this operation, P2.2 is supplied with 3.3 V, by driving a high (logic '1') to the port pin. This drives the 390-Ω resistor, the reference 10-k resistor, and the thermistor. P0.1 and P0.0 are the analog inputs to the ADC. The resistance of the thermistor changes according to temperature and it is about 10 k at 25 °C.

The 390-Ω resistor helps to prevent the input signal to the ADC from exceeding the supply voltage rails. The ratio of the voltages at P0.0 and P0.1 is proportional to the absolute temperature. This ratiometric reading eliminates inaccuracies because of supply voltage.

### 4.3.3 LED Connections

Two LEDs are available on the FTRF expansion board. The green LED is connected to P1.3 and the red LED is connected to P1.2 on the CY8C27443 on the RF expansion board. P1.2 and P1.3 are configured as active LOW outputs.

Figure 4-12. LED Connections




**Green LED:** The green LED is turned on when the node enters Bind mode. The green LED is turned off if the bind is successful or when the Bind mode times out. The node firmware causes the green LED to blink on successful transmission of a data packet. Success of a transmission is determined by reception of the 'ACK' packet from the hub when a data packet is sent.

**Red LED:** The red LED blinks at a five second interval when bound. When SW2 is pressed for more than two seconds, the red LED illuminates solid indicating that the report interval was advanced to the next interval. When SW2 is released the red LED flashes according to the selected interval:

- 1 = 1 second
- 2 = 5 seconds
- 3 = 30 seconds
- 4 = 1 minute
- 5 = 5 minutes

The power on default is five seconds.

## 4.4 FirstTouch Multifunction (FTMF) Expansion Card

The FTMF expansion card contains a PSoC CY8C21434 that acts as the 'host' for various demonstrations. The FTMF expansion card has hardware to support the following PSoC powered peripheral applications:

- CapSense 7-Element Touch Slider
- CapSense NonTouch/Proximity Detection
- Ambient Light-Level Detection
- Thermistor-based Temperature Measurement

In addition to the above input sensors, the FTMF card also provides the following output devices:

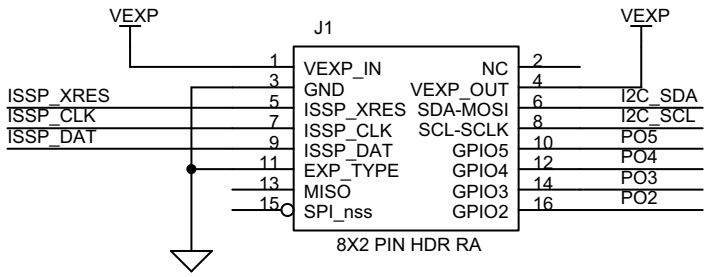
- Red-Green-Blue Triple LED Cluster
- Buzzer
- I2C Digital Communications
- Four Unused A/D GPIO Lines for User Functions

The dedicated sensors and output devices on the FTMF expansion card help you quickly evaluate and experiment with a variety of PSoC applications, without having to build any hardware. Your PSoC Designer project completely determines the remaining FTMF expansion card functions. The kit installation contains demonstration projects that use the following input sensors:

- CapSense slider
- Temperature sensor
- Ambient light sensor
- CapSense proximity sensor

The FTMF expansion card uses a standard FirstTouch expansion header to connect to the FirstTouch RF expansion board or other target hardware.

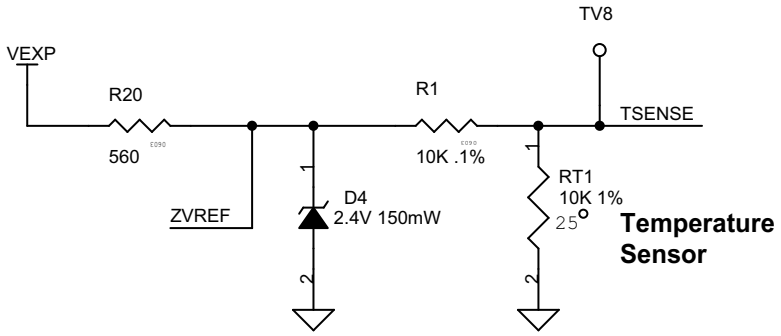
Figure 4-13. FTMF Expansion Card



Note that the 8×2 pin expansion header also includes four GPIO connections labeled P02 to P05. These are hard wired to four unused Port 0 I/O pins on the CY8C21434 host and allow you to easily connect the FTMF expansion card to specific hardware or sensors. These I/O pins are specifically chosen because they can operate as analog outputs, analog inputs, digital inputs, digital outputs, or any combination of the four types. This pin selection makes them true analog or digital GPIO.

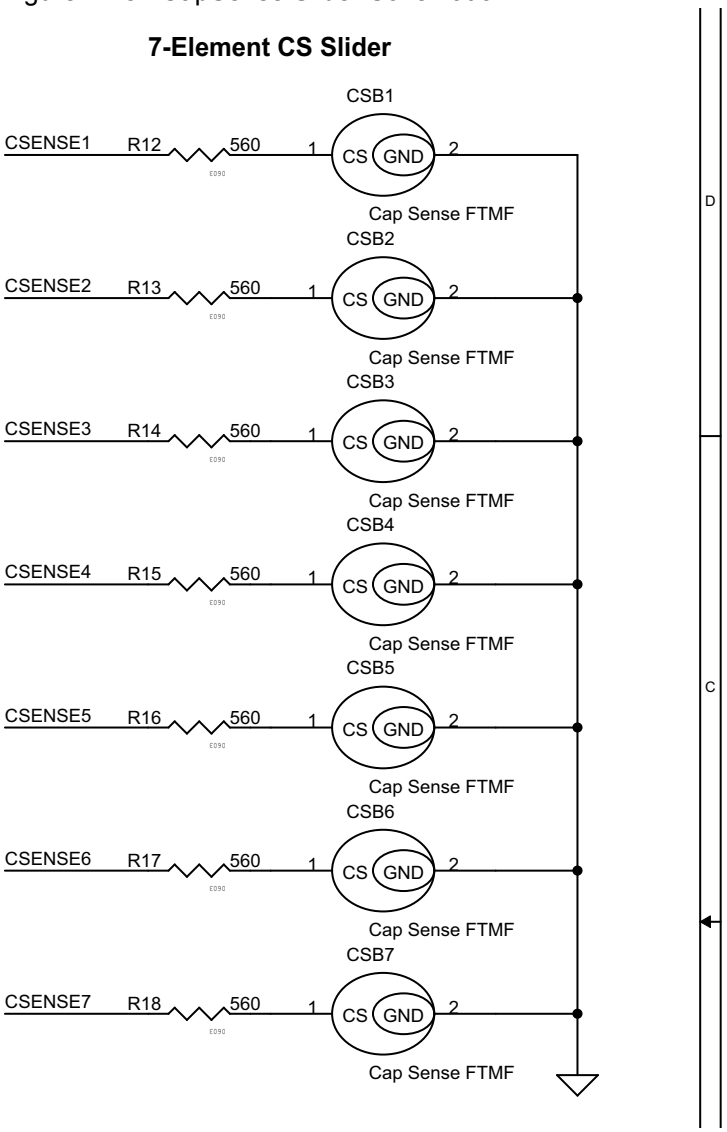
You can use the sensors and output devices in any way you want within your project, but always assign the correct pins within your project. Failure to do so may cause unpredictable or unplanned project results.

Figure 4-14. On-Board Thermistor Schematic



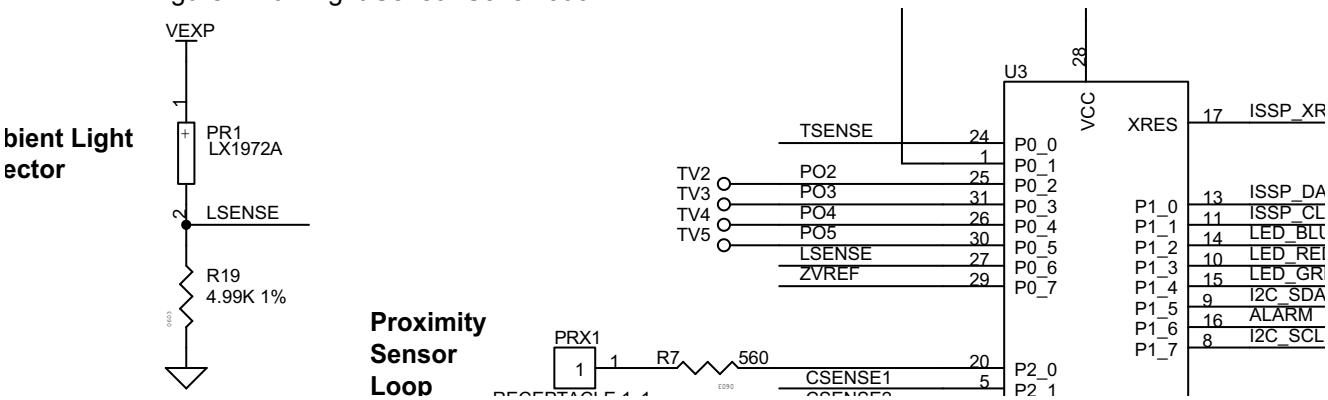

P0[0] is used to sense temperature incident on MF card. A thermistor is used to measure the temperature and is given as the input to PSoC. LEDs are used to represent the different values acquired from the device. The buzzer can be used as a sound alert when the data goes above or below a certain level.

Figure 4-15. CapSense Slider Schematic



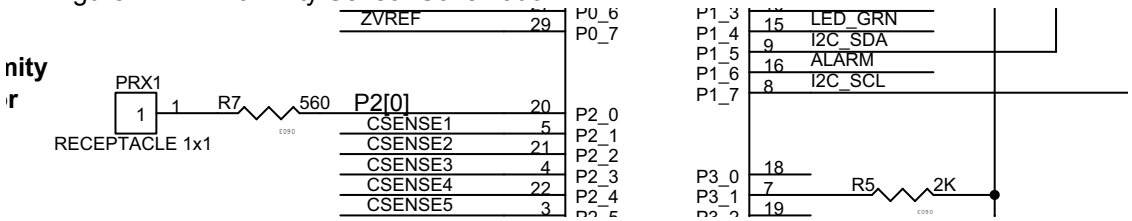

P2[1] to P2[7] to sense the touch on the 7-Element CapSense region of the card. The PSoC CY8C21434 that resides on the FTMF expansion card detects finger position on the CapSense touch sensing slider and controls the LED output. Adopting capacitive sensing as an interface technology in high-volume, high-visibility applications such as portable media players and mobile handsets has created demand for the same technology in more conventional consumer electronics. Figure 4-13 shows the hardware details.

Figure 4-16. Light Sensor Schematic




Port P0[6] “LSENSE” is connected to the light sensor to receive signals for light sensitivity. Ambient light sensors consist of a filter to sample visible light, a photo diode for detection of brightness, a digital filter, and a digital/analog converter.

Figure 4-17. Proximity Sensor Schematic




The proximity detector requires the use of a proximity antenna and can sense an object in an approximate range of 2 to 3 inches. In the CY3271-FTRF kit, this sense antenna is formed by attaching the provided wire into the pin socket labeled PRX1.

**Note** On power up, the FTMF establishes a baseline reading of the proximity antenna. It is therefore necessary to connect the proximity antenna before plugging in the CY3271-FTRF kit. The project is set up to recalculate this baseline approximately every 30 seconds. Also, notice how the shape and position of the wire affects the demonstration operation and the proximity sensing distance.

### 4.4.1 CY8C21434 Chip

Port P0[6] “LSENSE” is connected to light sensor to receive signals for light sensitivity, P0[0] to sense temperature incident on MF card. P1[6] drives a buzzer. P1[2], P1[3], and P1[4] drive the blue, red, and green LEDs, respectively. P2[1] to P2[7] senses the touch on the 7-Element CapSense region of the card.

Figure 4-18. CY8C21434 Master Schematic

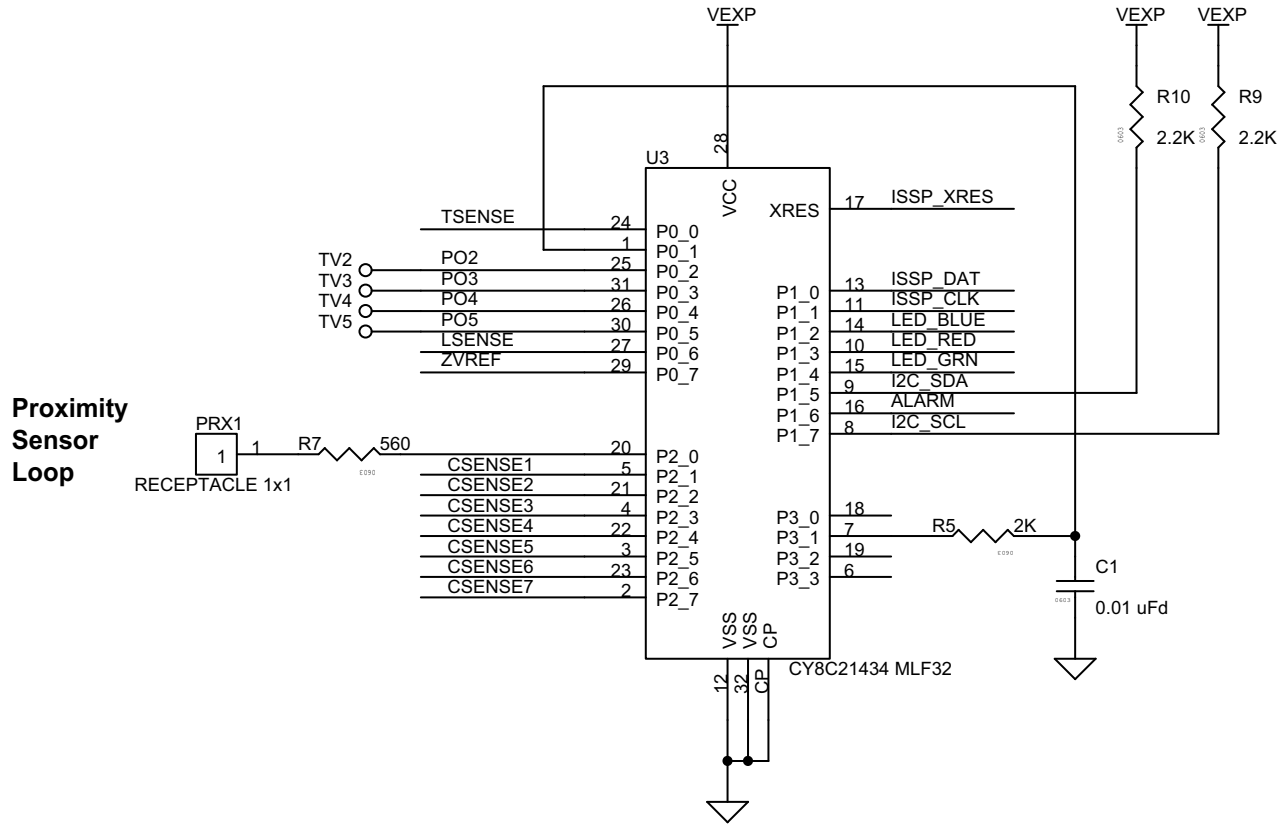



Table 4-2. CY8C21434 Hardware Connectivity

| Pin Number | Port Number | Design Function |
|---|---|---|
| 1 | P0[1] | CapSense modulator capacitor |
| 2 | P2[7] | CapSense slider element 7 |
| 3 | P2[5] | CapSense slider element 5 |
| 4 | P2[3] | CapSense slider element 3 |
| 5 | P2[1] | CapSense slider element 1 |
| 6 | P3[3] | Unused/no-connect |
| 7 | P3[1] | CapSense feedback resistor |
| 8 | P1[7] | I2C clock line (SCL) |
| 9 | P1[5] | I2C data line (SDA) |
| 10 | P1[3] | Red LED drive |
| 11 | P1[1] | In system programming clock (ISSP_SCLK) |
| 12 | GND | |
| 13 | P1[0] | In system programming data (ISSP_DAT) |
| 14 | P1[2] | Blue LED drive |
| 15 | P1[4] | Green LED drive |
| 16 | P1[6] | Alarm/buzzer FET drive |
| 17 | XRES | In system programming reset pin (ISSP_XRES) |
| 18 | P3[0] | Unused / no-connect |
| 19 | P3[2] | Unused / no-connect |

Table 4-2. CY8C21434 Hardware Connectivity *(continued)*

| Pin Number | Port Number | Design Function |
|---|---|---|
| 20 | P2[0] | CapSense proximity antenna pad (PRX1) |
| 21 | P2[2] | CapSense slider element 2 |
| 22 | P2[4] | CapSense slider element 4 |
| 23 | P2[6] | CapSense slider element 6 |
| 24 | P0[0] | Thermistor temperature sensor analog input |
| 25 | P0[2] | User A/D-GPIO |
| 26 | P0[4] | User A/D-GPIO |
| 27 | P0[6] | Ambient light detector analog input |
| 28 | +Vdd | |
| 29 | P0[7] | Thermistor drive-voltage reference analog input |
| 30 | P0[5] | User A/D-GPIO |
| 31 | P0[3] | User A/D-GPIO |
| 32 | GND | |

## 4.5 AAA Power Pack

The AAA power pack can hold two AAA batteries and is used to power the RF expansion cards. It also contains a 16-pin connection header to connect with the RF board.

Figure 4-19. AAA Power Pack Schematic

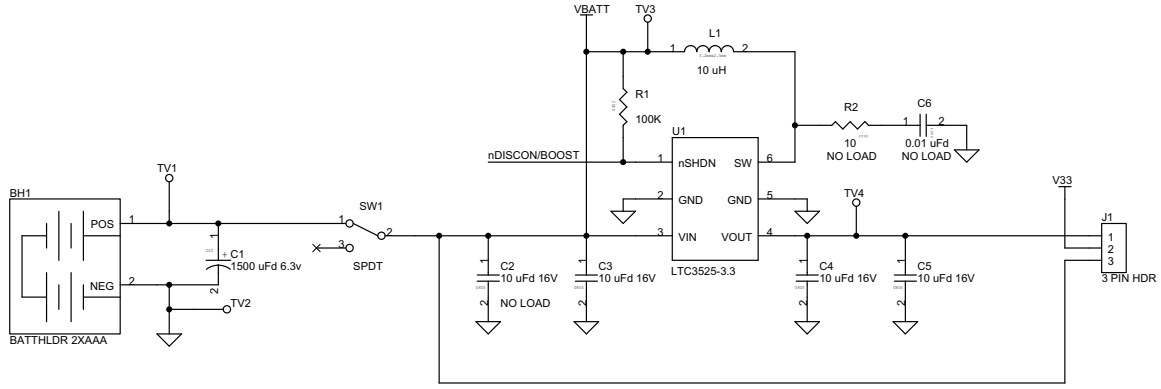
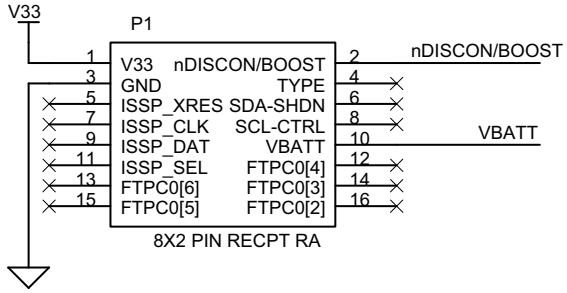



Figure 4-20. 8x2 Pin Connector Schematic



Board Regulator U1(LTC3525-3.3) in Figure 4-19 is a high efficiency synchronous step-up DC/DC converter with output disconnect that can start up with an input as low as 1 V. It offers a compact, high efficiency alternative to charge pumps in single cell or dual cell alkaline or Li-ion applications. The switch SW1 is used to supply power to FirstTouch RF expansion card. J1 is the 3-pin header, which acts as the jumper to the target board. The 8×2 connector is used to connect FirstTouch RF to the battery pack.

## 4.6 CR2032 Power Pack

The CR2032 power pack can hold one CR2032 coin cell battery and is used to power the RF expansion cards. This enables coin cell ultra low-power operation. It also contains a 16-pin connection header to connect with the RF board.

Figure 4-21. CR2032 Power Pack Schematic

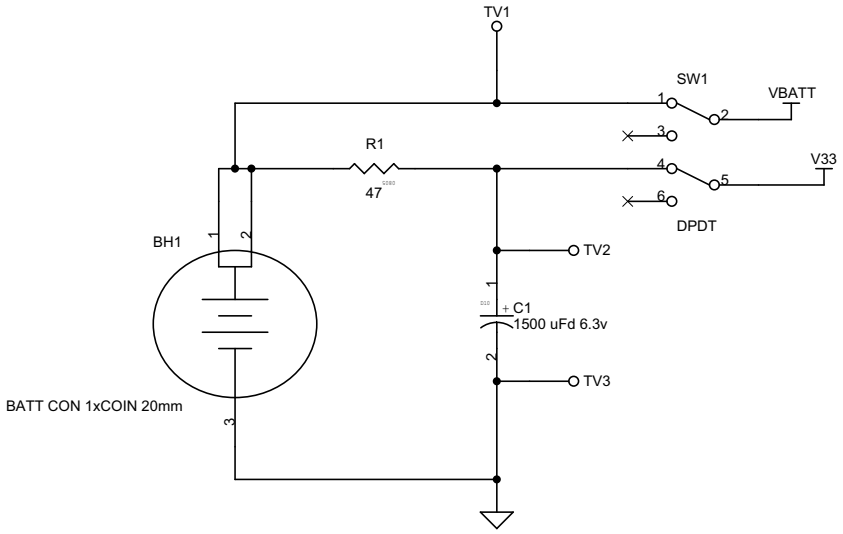
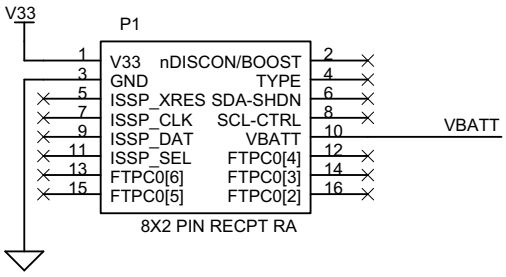



Figure 4-22. 8x2 Pin Connector




SW1 is used as the switch to the coin cell CR2032. VBATT and V33 is used to supply power for RF expansion board and FTMF board. A resistor is connected between TV1 and TV2 and a capacitor is connected between TV2 and TV3. TV1, TV2, and TV3 can be used as the test points. A 8×2 connector is used to connect FTRF expansion board and multifunction expansion board to battery pack.

# 5. Code Examples

All code examples are available on the CY3271-FTRF kit CD/DVD at the following location: `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Firmware.`

**Note** To view the output on the SCD, make sure that the FTRF board is programmed with the RF_I2C_BRIDGE.hex file, located at `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Firmware\RF_I2C_BRIDGE\RF_I2C_BRIDGE\output\` in the kit CD/DVD.

## 5.1 My First Code Example

### 5.1.1 Project Objective

This code example demonstrates the CapSense feature of the FTMF board. The LED color changes with the finger position on the board.

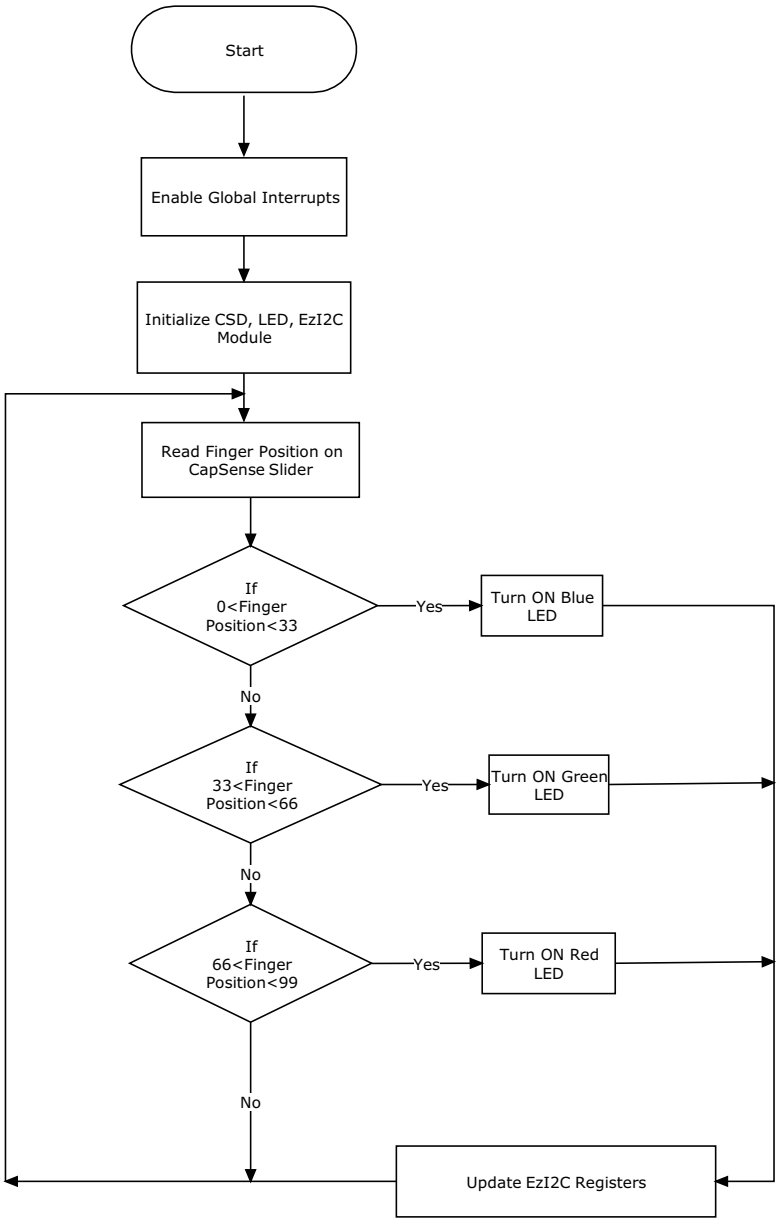
The project contains the following user modules:

**CSD:** The CSD module is used to scan the CapSense sensors and determine the finger position on the slider when touched.

**LED:** The LED module is used to display the output based on the data from CapSense.

**EzI2Cs:** The EzI2Cs module configures the PSoC on a multifunction board as I2C slave. The slave data is available for acquisition using a bridge board that is configured as I2C master.

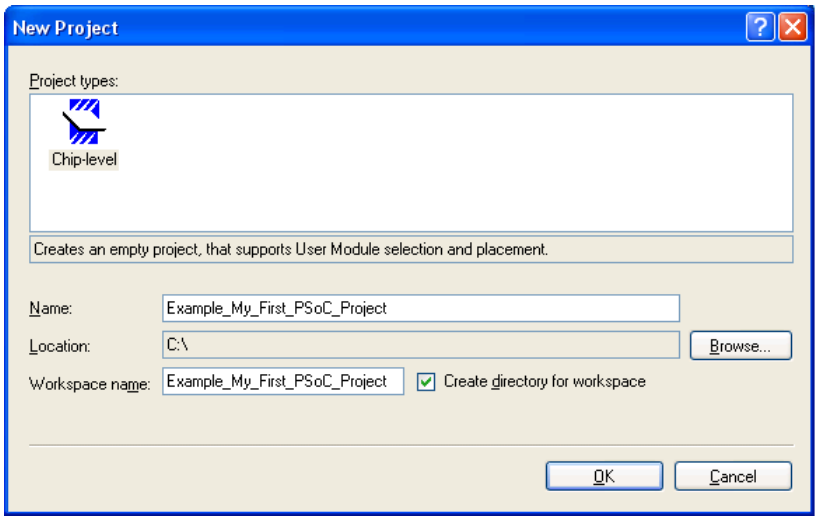
### 5.1.2 Flowchart




### 5.1.3 Creating My First PSoC 1 Project

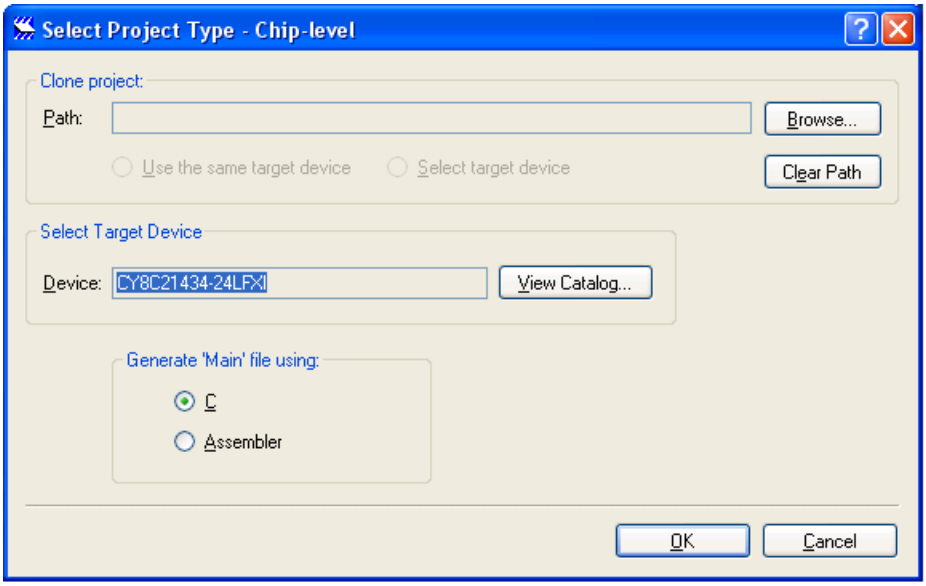
1. Open PSoC Designer.
2. To create a new project, click **File > New Project**. The New Project window opens.
3. In this window, select the **Chip-level** icon. Name the project **Example_My_First_PSoC_Project,** as shown in Figure 5-1.
4. Click **Browse** and navigate to the directory in which the project must be created.

Figure 5-1. New Project Window



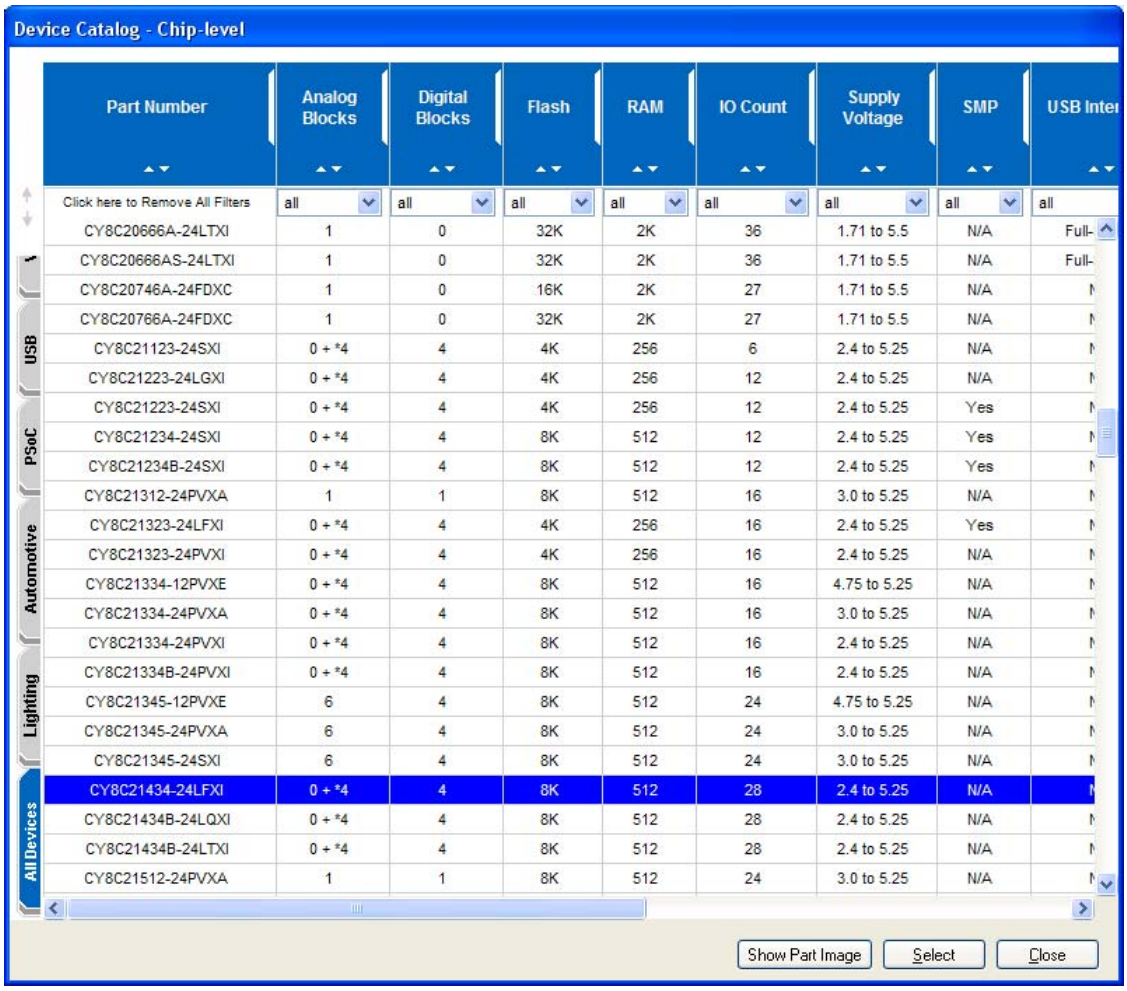

5. Click **OK**. The Select Project Type window opens.
6. In this window, under Select Target Device, click **View Catalog**; see Figure 5-2.

Figure 5-2. Select Project Type Window



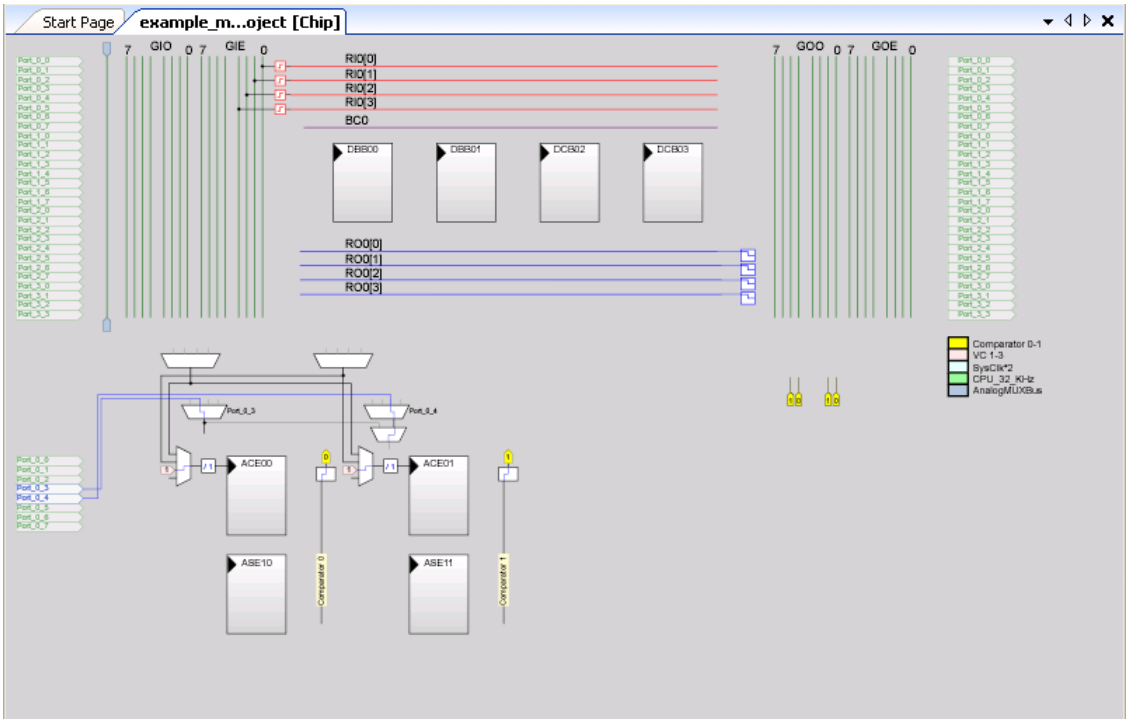

7. The Device Catalog window opens. Click on the **All Devices** tab.
8. Click **CY8C21434-24LFXI** and then click **Select**. See Figure 5-3.

Figure 5-3. Device Catalog Window



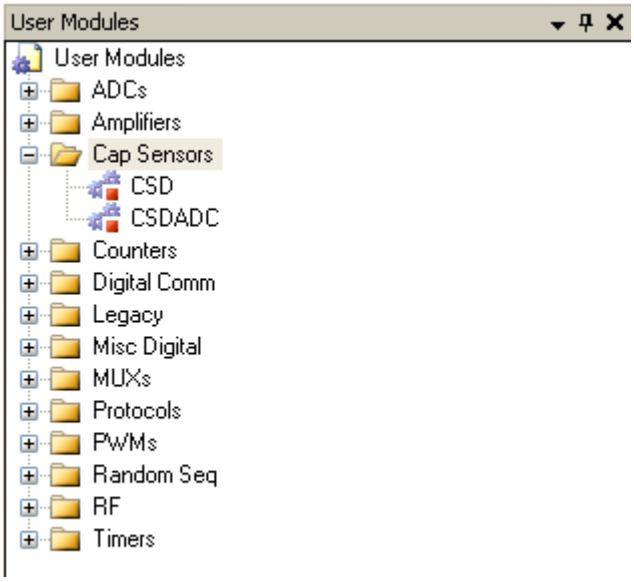

9. Under Generate 'Main' File Using, select **C** and then click **OK**.
10. By default, the project opens in chip view, as shown in Figure 5-4.

Figure 5-4. Default View



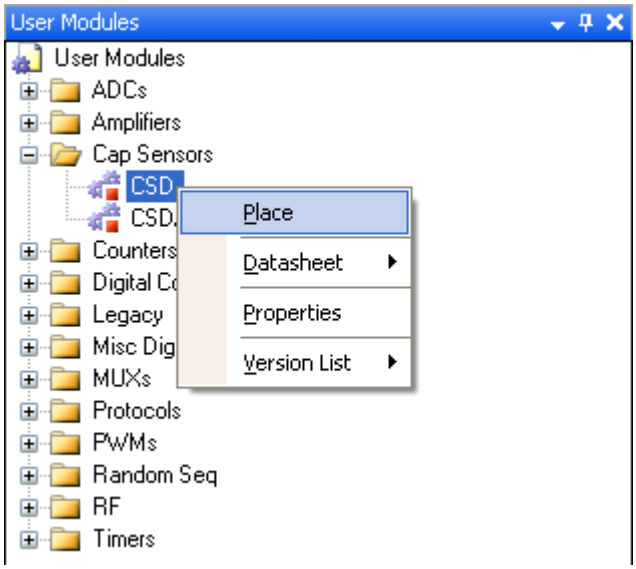

11. In the User Modules window, select the **Cap Sensors** folder and expand it.

Figure 5-5. User Modules Window



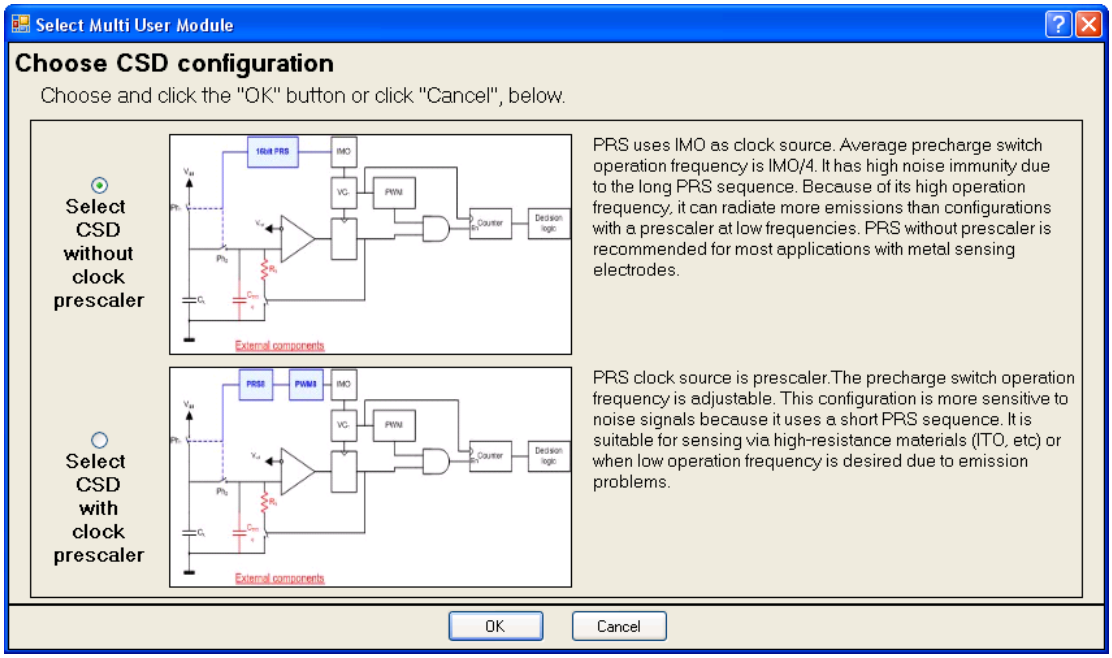

12. In this folder, right-click on **CSD** and select **Place**.

Figure 5-6. User Modules Window-CSD Select



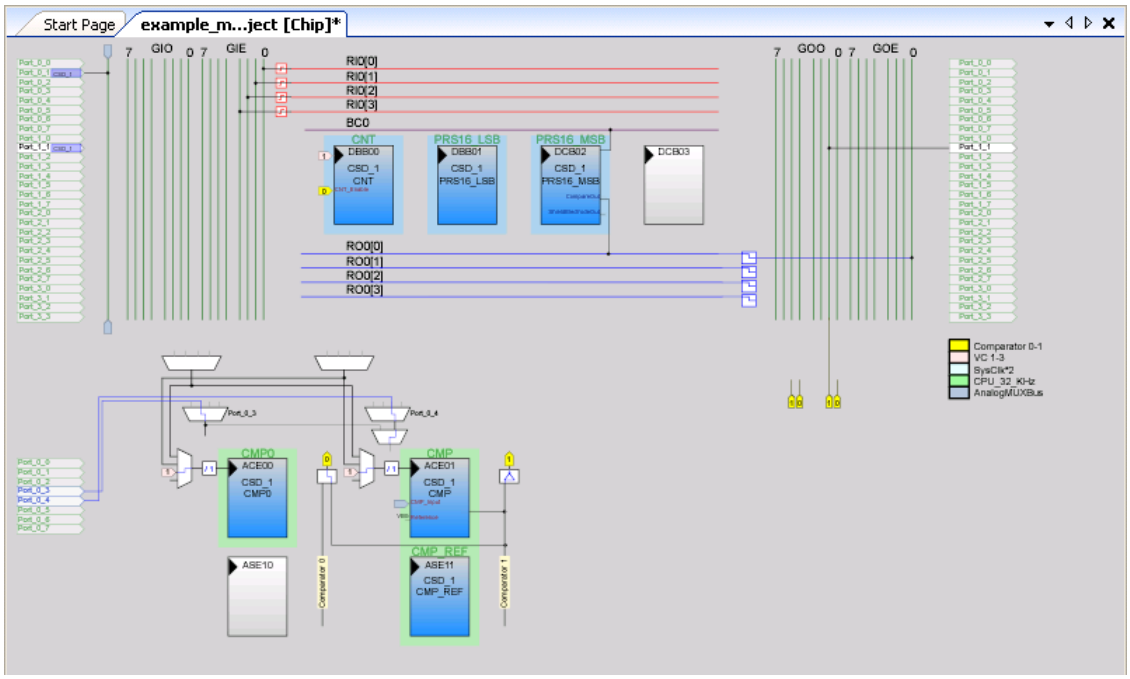

13. A pop-up window opens with the options for configuration of the CSD module. Click **Select CSD without clock prescaler**, as shown in Figure 5-7. Click **OK**.

Figure 5-7. CSD Configuration Window Select




14. The CSD user module is placed in the analog and digital blocks, as shown in Figure 5-8.

Figure 5-8. CSD User Module Placement




15. Rename CSD_1 as **CSD** and configure the CSD properties.

Figure 5-9. Configured CSD Parameters Window

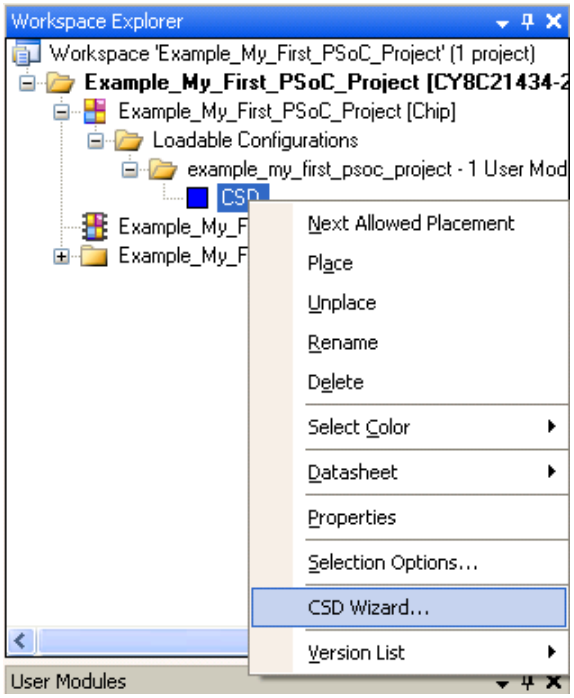
Parameters - CSD_1

| | |
|---|---|
| Name | CSD |
| User Module | CSD |
| Version | 1.50 |
| FingerThreshold | 40 |
| NoiseThreshold | 20 |
| BaselineUpdateThreshol | 200 |
| Sensors Autoreset | Enabled |
| Hysteresis | 10 |
| Debounce | 3 |
| NegativeNoiseThresholc | 20 |
| LowBaselineReset | 50 |
| Scanning Speed | Normal |
| Resolution | 12 |
| Reference | VBG |
| Ref Value | 2 |
| ShieldElectrodeOut | None |

**Name**
Indicates the name used to identify this User Module instance

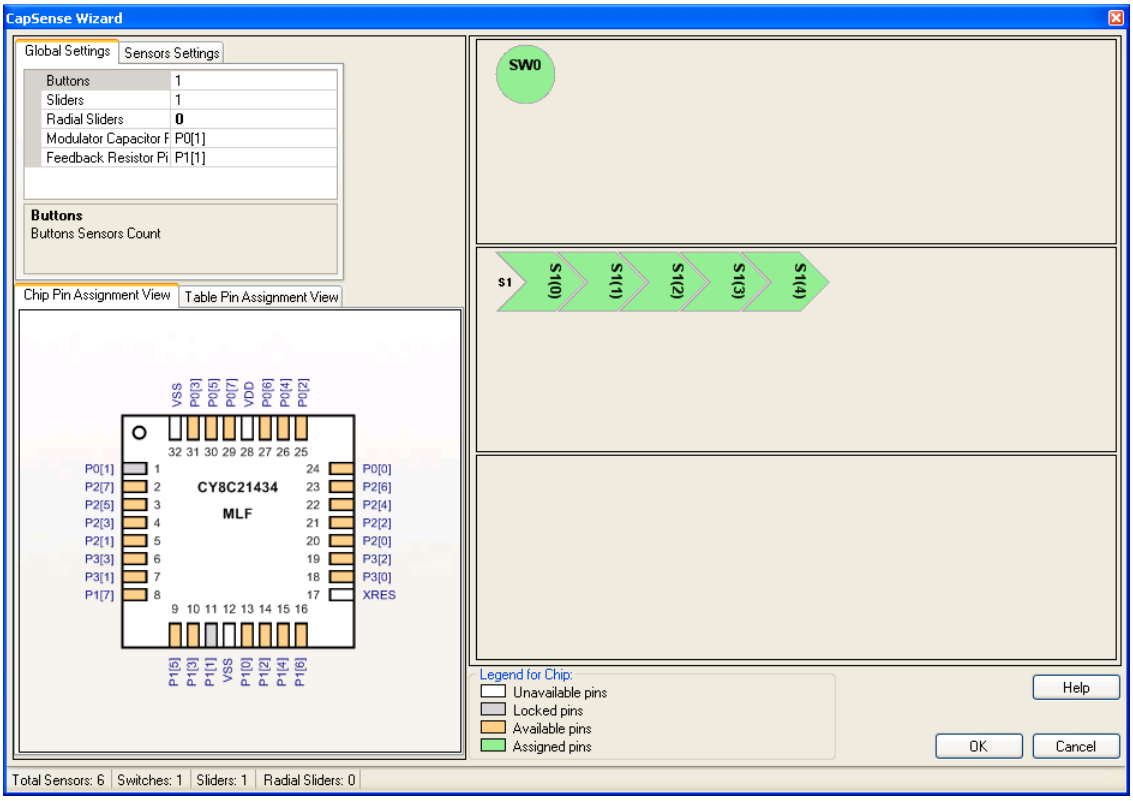
16. Right-click on the **CSD** folder and select **CSD Wizard**.

Figure 5-10. Select CSD Wizard




17. Open the CSD Wizard window.

Figure 5-11. Default CSD Wizard Window



18. Figure 5-12 shows the default settings in the Global Settings window. Configure the parameters in the window, as shown in Figure 5-13.

Figure 5-12. Default Global Settings Window

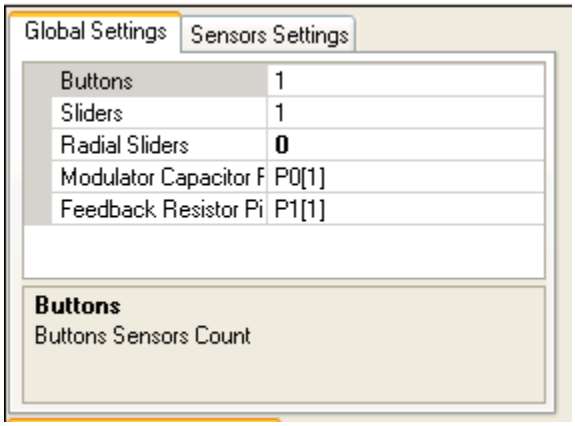
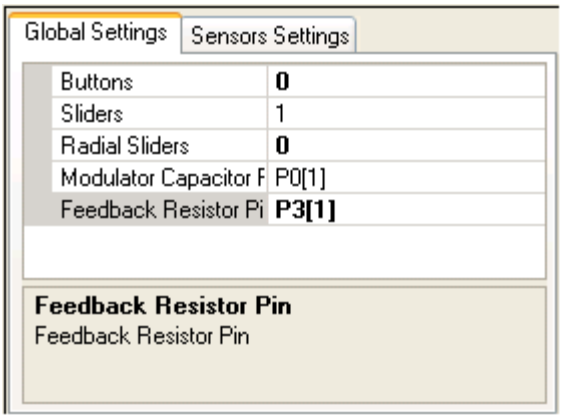
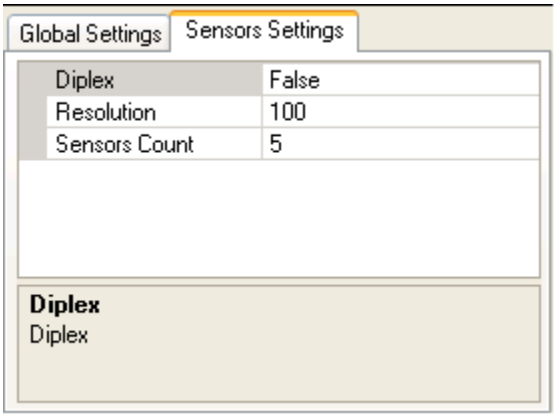



Figure 5-13. Configured Global Settings Window



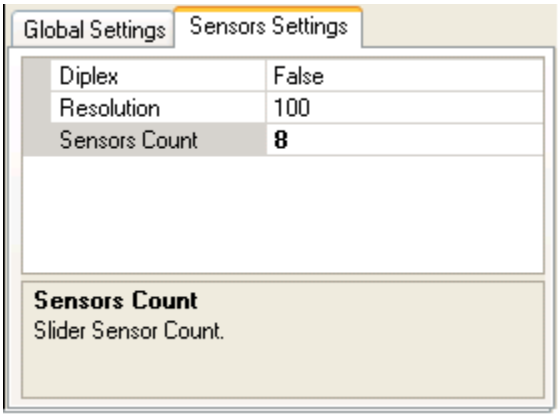

19. Click on the **Slider** in the CSD Wizard. The default settings in the Sensors Settings window are shown in the following figure.

Figure 5-14. Default Sensors Settings



20. Configure the parameters in the Sensors Settings, as shown in Figure 5-15.

Figure 5-15. Configured Sensor Settings




21. To assign the sensor on the particular pin, click and drag from the sensor block to the required pin in either the Chip Pin Assignment View or Table Pin Assignment View in the CapSense wizard. Drag and drop S1 (0) of the slider to pin P2 [0]. The sensor pin assignment can be done in either Table Pin Assignment View (Figure 5-16) or Chip Pin Assignment View (Figure 5-17).

Figure 5-16. S1 (0) Placed on P2 [0] Pin Block

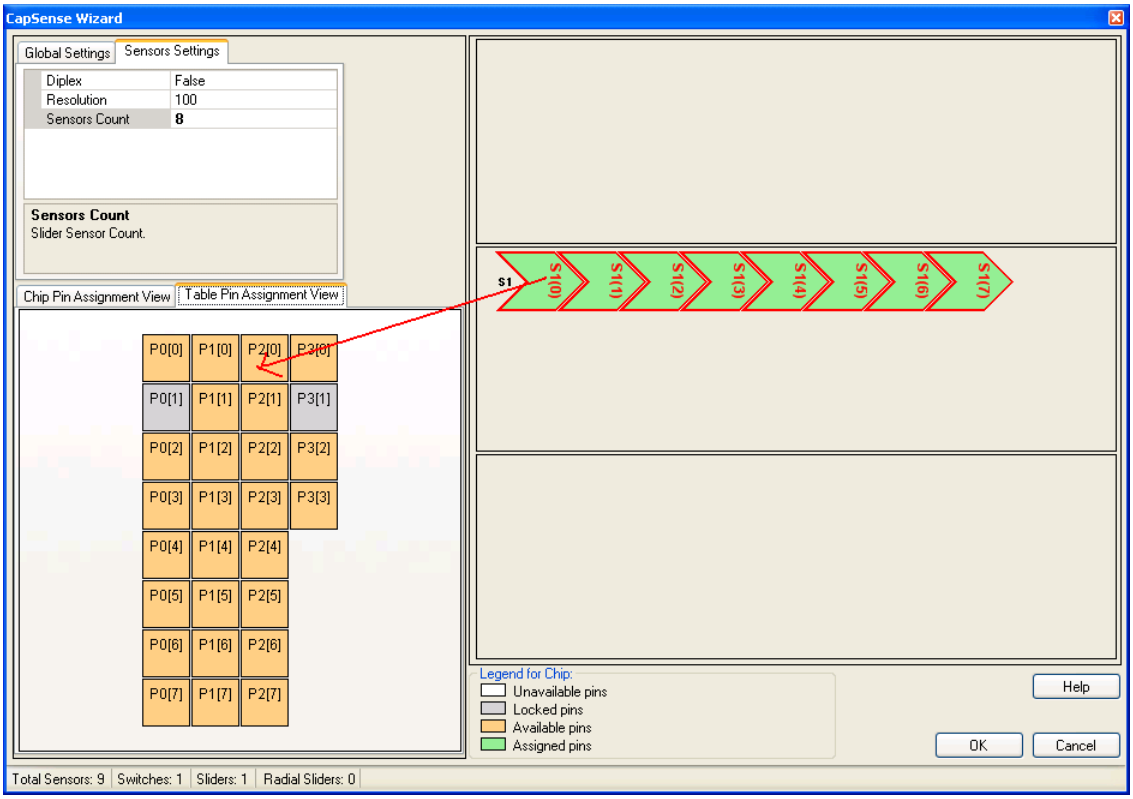
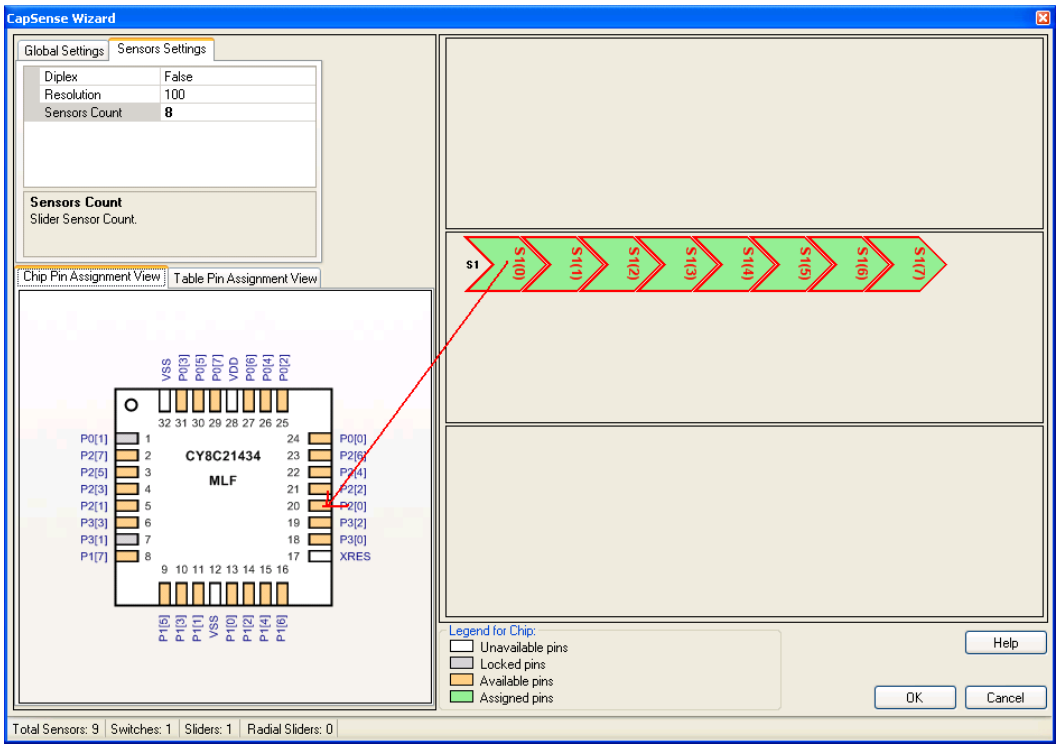
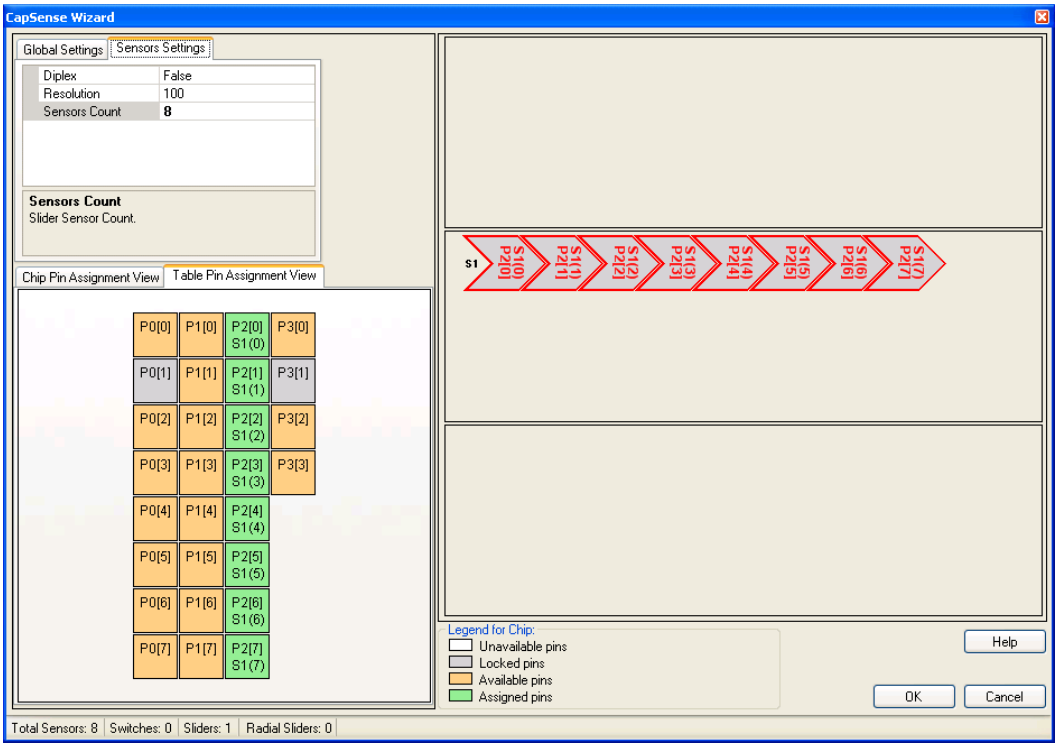


Figure 5-17. S1 (0) Assigned to Pin P2 [0]



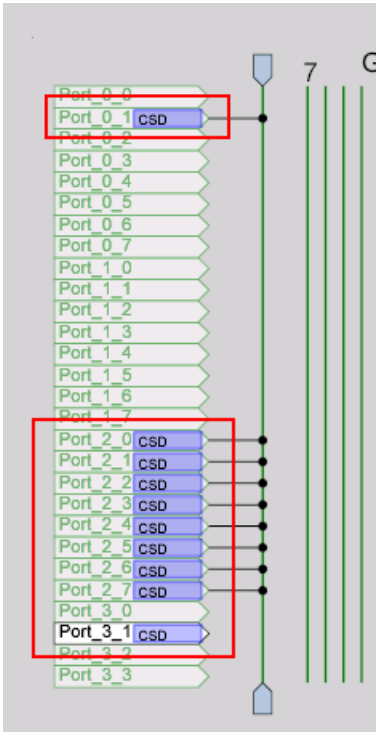

22. Similarly, assign all the sensors from S1(1) through S1(7) to pins P2[1] through P2[7], as shown in Figure 5-18 and click **OK**.

Figure 5-18. Sensors Assigned - Table Pin Assignment View



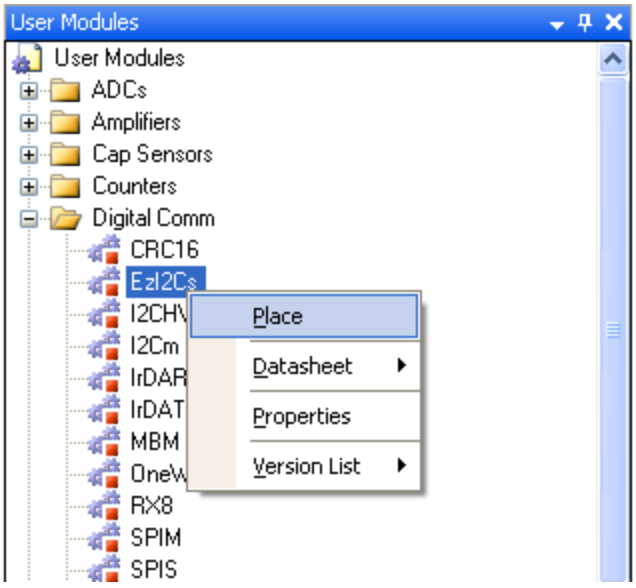
23. After configuration, the pins to which sensors are assigned are seen in the Chip Level diagram.

Figure 5-19. CSD Component



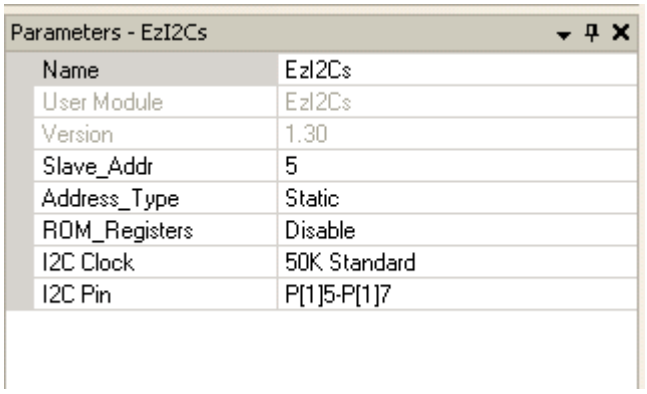

24. In the User Modules window, expand the **Digital Comm** folder, select **EzI2Cs**, right-click and select **Place**.

Figure 5-20. EzI2Cs User Module Selection



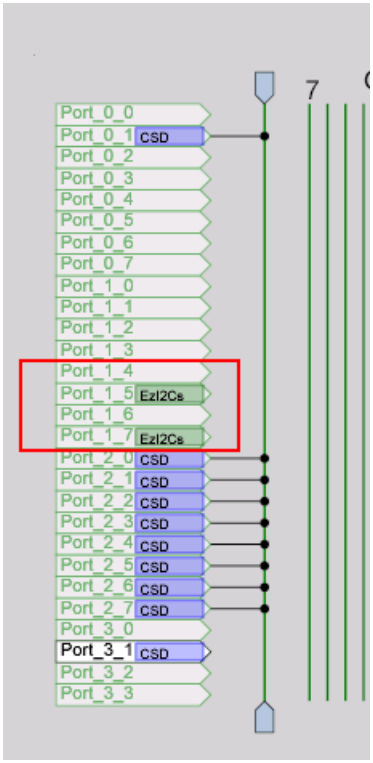

25. The EzI2Cs module does not require any digital or analog blocks for placement. It requires either (configurable) P1[0] and P1[1] or P1[5] and P1[7] port pins to operate as SCL and SDA.
26. Configure the EzI2Cs properties, as shown in Figure 5-21.

Figure 5-21. EzI2Cs Properties



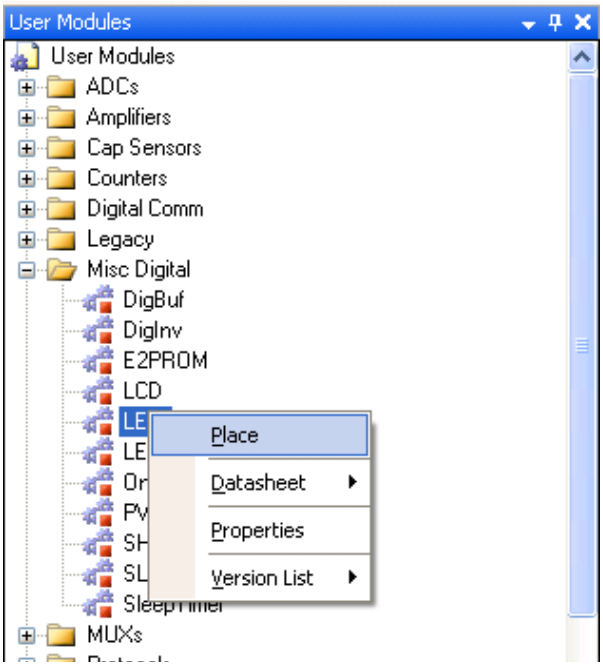

27. The EzI2Cs module can be seen in the Chip window, as shown in the following figure.

Figure 5-22. EzI2Cs Component



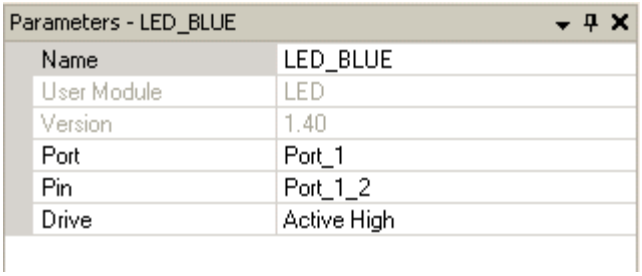

28. In the User Modules window, expand the **Misc Digital** folder, right-click on **LED**, and select **Place** to place the LED.

Figure 5-23. User Modules Window - LED Select



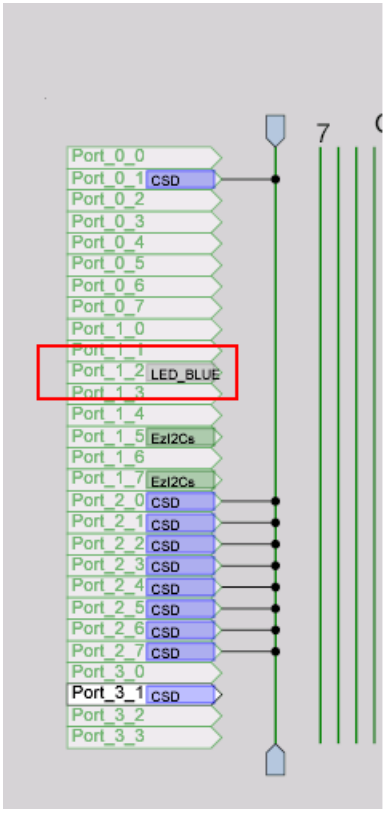

29. Configure the LED properties and rename as **LED_BLUE**, as shown in Figure 5-24.

Figure 5-24. LED Properties




30. After configuration, the LED_BLUE is assigned and is visible in the Chip Level diagram.

Figure 5-25. LED User Module Placement




31. Similarly, place two more LED modules and configure, as shown in Figure 5-26 and Figure 5-27.

Figure 5-26. LED Properties

Parameters - LED_RED

| | |
|---|---|
| Name | LED_RED |
| User Module | LED |
| Version | 1.40 |
| Port | Port_1 |
| Pin | Port_1_3 |
| Drive | Active High |

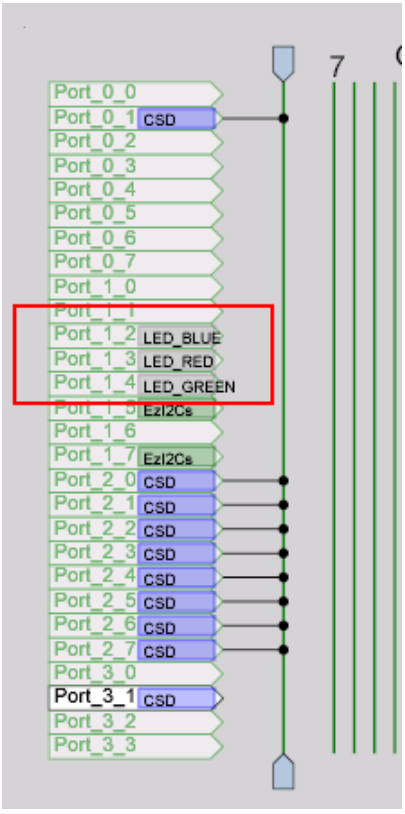
Figure 5-27. LED Properties

Parameters - LED_GREEN

| | |
|---|---|
| Name | LED_GREEN |
| User Module | LED |
| Version | 1.40 |
| Port | Port_1 |
| Pin | Port_1_4 |
| Drive | Active High |

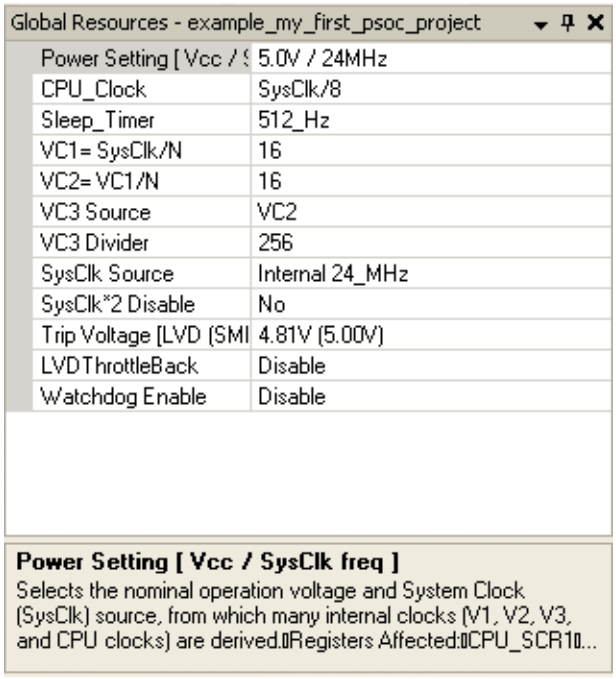
32. LED_GREEN, LED_RED, and LED_BLUE are placed in their respective ports.

Figure 5-28. All LEDs Placed



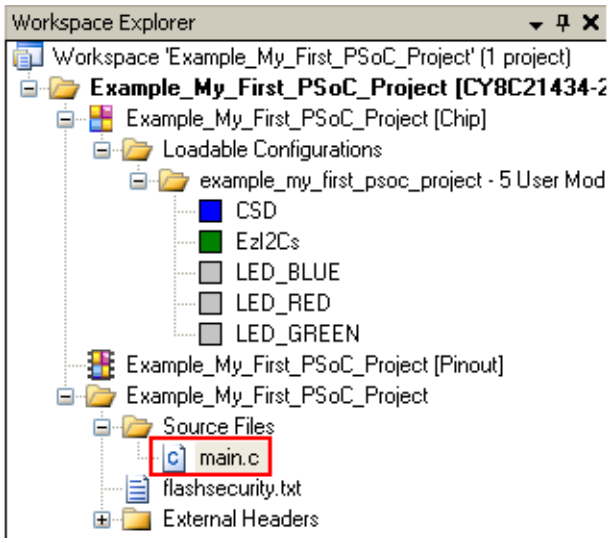

33. Keep the default values for Global Resources window.

Figure 5-29. Global Resources Window



34. Open the existing *main.c* file within Workspace Explorer. Replace the existing *main.c* content with the content of *Example_ My_First_PSoC_Project_Main.c* file, which is attached to this document.

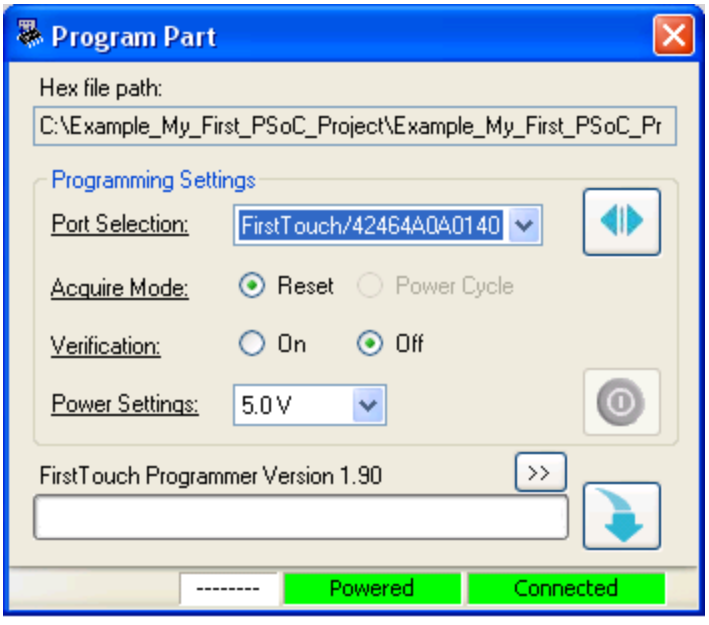
Figure 5-30. Workspace Explorer Window




35. Save the project.
36. Click on **Build > Generate/Build 'Example_My_First_PSoC_Project'**.
37. Connect the PC bridge to a free USB port on the PC.
38. Connect the FTMF card to the PC bridge
39. Click on **Program > Program Part**.

**Note** While programming the board through PSoC Designer, close any open instance of PSoC Programmer.

Figure 5-31. Program Part Window

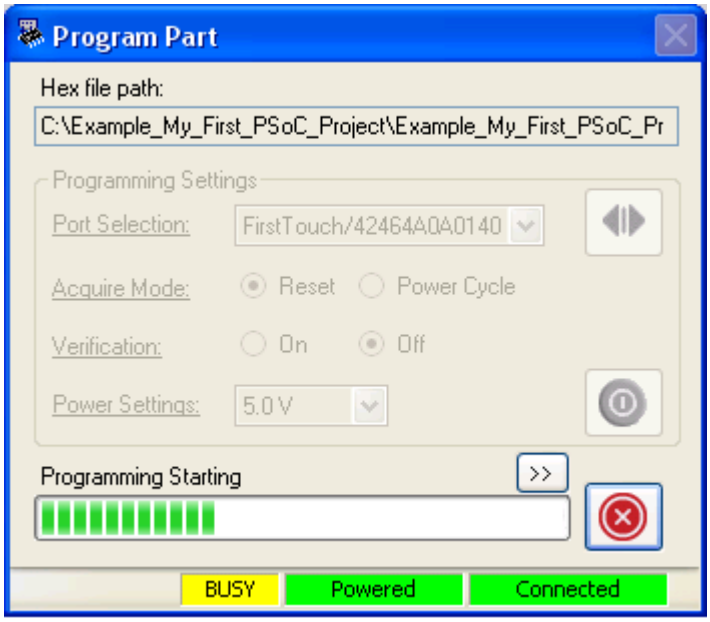



40. In the Program Part window, set the following:

a. In Port Selection drop down box, select **FirstTouch/<MiniProg Number>** and **Connected**
b. Acquire Mode: **Power Cycle**
c. Verification: **Off**
d. Power Settings: **5.0 V**

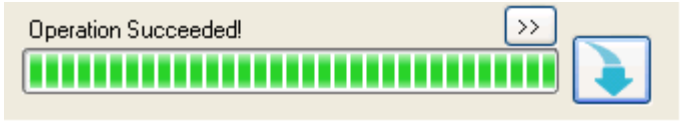
41. Click on the **Program** button to start programming the board.
42. The board starts programming; you can observe the status on the progress bar (Figure 5-32).

Figure 5-32. Programming Status




43. When the programming is done successfully, the 'Operation Succeeded!' message is shown.

Figure 5-33. 'Operation Succeeded!' Message




44. Disconnect the PC bridge from the USB port of the PC.

### 5.1.4 Verify Output

1. Move your finger across the CapSense slider to detect LED color change.
   a. When the finger is on slider position CSB1-CSB3, the LED emits the color blue.
   b. When the finger is on slider position CSB4 or CSB5, the LED emits the color green.
   c. When the finger is on slider position CSB6 or CSB7, the LED emits the color red.
2. For all other slider positions, the LED is off. This includes the absence of a finger on the slider.

Figure 5-34. Finger Centroid and LED Update for CapSense Slider


Slider Position: CSB1-CSB3


Slider Position: CSB4-CSB5


Slider Position: CSB6-CSB7

To configure and connect FTMF board to the SCD and verify the output, see Configuring Sense and Control Dashboard on page 15. Load *Template CapSense Slider.node.xml* and view the output on the GUI.

Figure 5-35. Connect RF Expansion Board to 2x AAA Alkaline Cell Battery and Multifunction Board

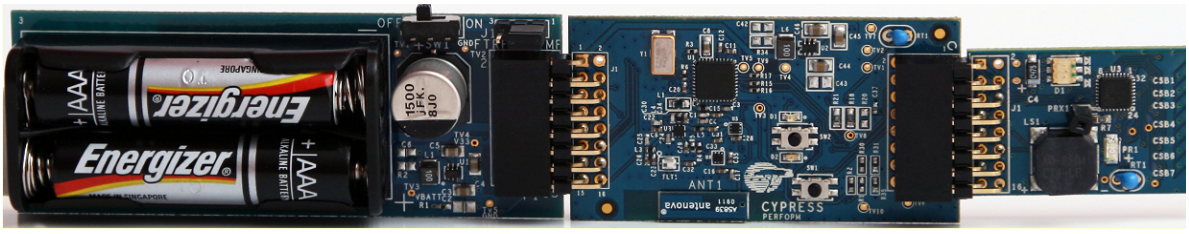
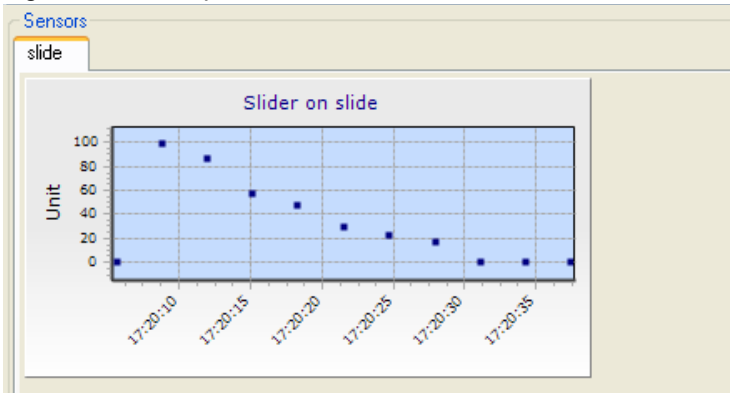



Figure 5-36. Output in Sense and Control Dashboard



## 5.2 Multifunction Expansion Card Light Sensor

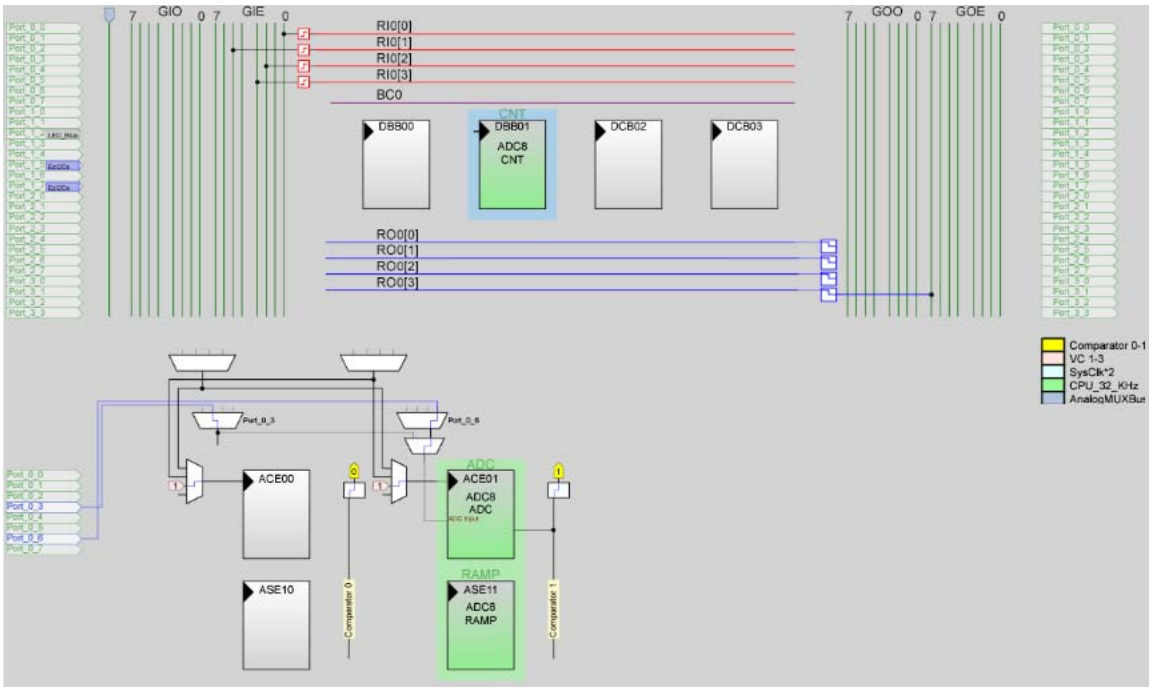
This project demonstrates how to use a light sensor to control the brightness of the LED array. The project includes the following user modules:

- **ADC**: This module converts the analog input to the digital form. The ADC module is used to obtain the digital values for light intensity.
- **LED**: This module is used to display the output based on data from CapSense.
- **EzI2Cs**: This module configures PSoC on the multifunction board as I2C slave. The slave data is available for acquisition using a bridge board that is configured as I2C master.

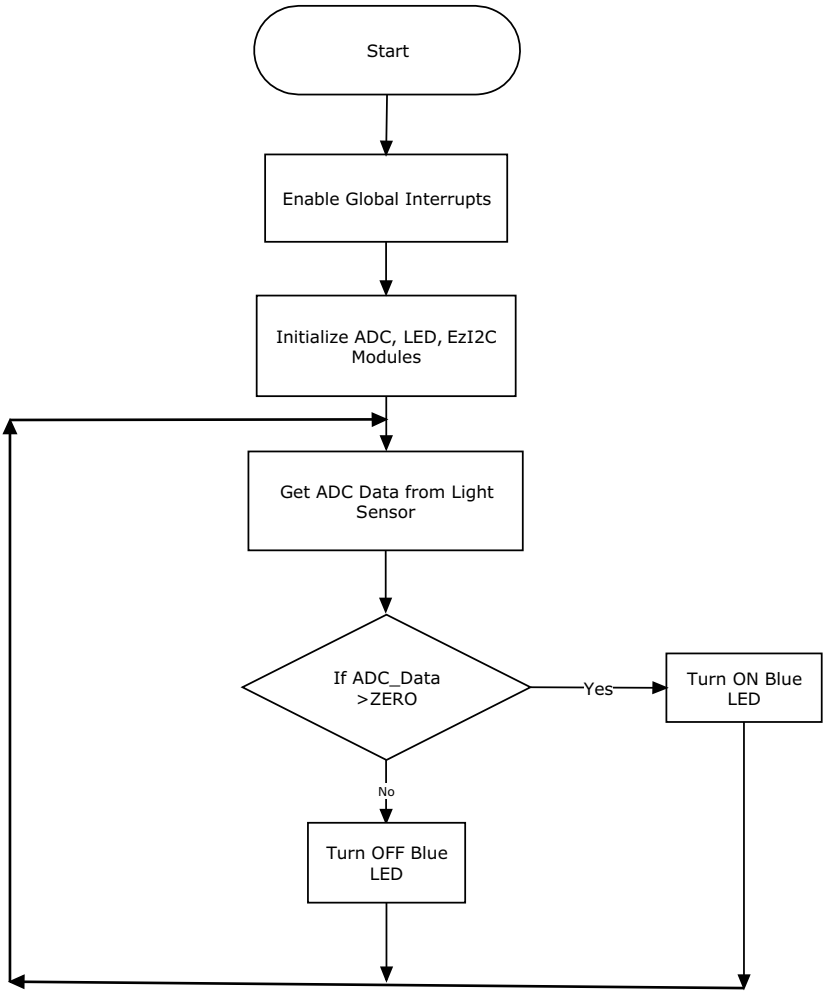
### 5.2.1 Device Configuration

The Chip Level View of the project after placing all the required user modules is shown in Figure 5-37.

Figure 5-37. Device Configuration for Light Sensor



### 5.2.2 Flowchart




### 5.2.3 Verify Output

When there is light, the LED is switched on; when there is no light, the LED is switched off.

Figure 5-38. Light Sense Output - LED Off

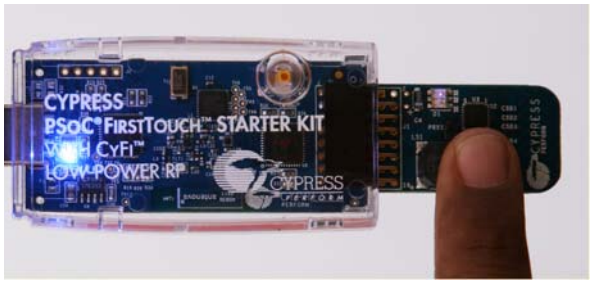
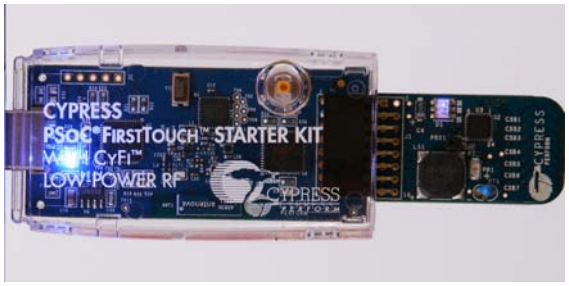


Figure 5-39. Light Sense Output - LED On




To configure and connect FTMF board to the SCD and verify the output, see Configuring Sense and Control Dashboard on page 15. Load the *Template Light.node.xml* and view the output on the GUI.

Figure 5-40. Connect RF Expansion Board to 2x AAA Alkaline Battery and Multifunction Board

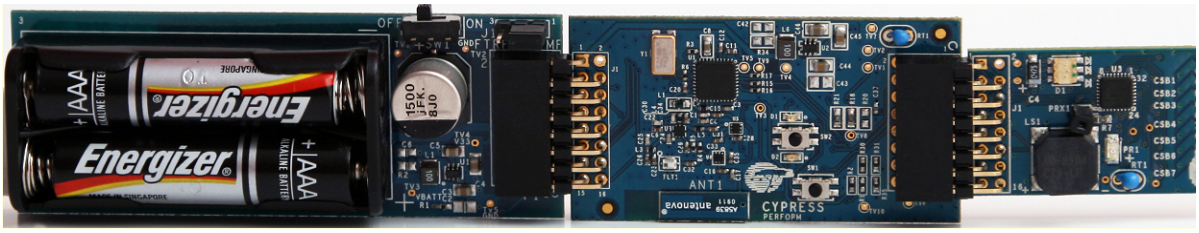
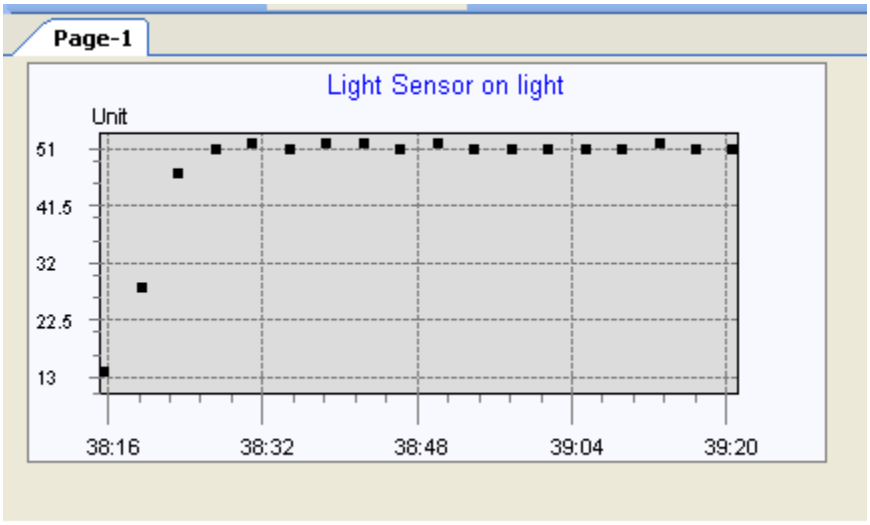



Figure 5-41. SCD Output



## 5.3 Multifunction Expansion Card Proximity Sensor

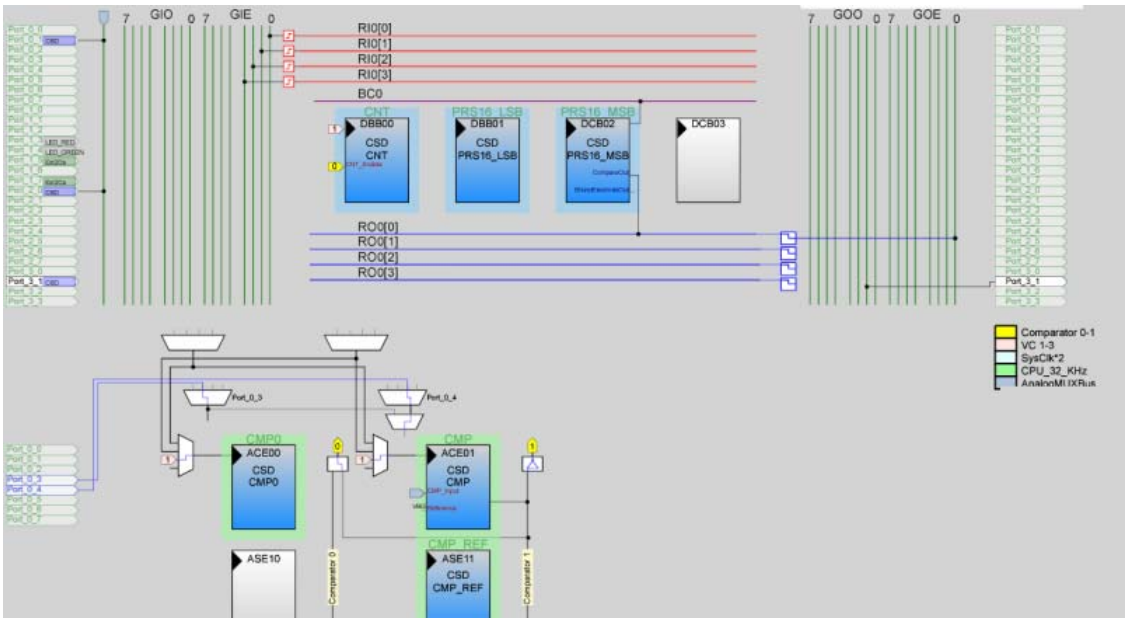
This project demonstrates the capacitive sensing and proximity detection capability of the PSoC technology. Proximity detection requires that you use the supplied blue proximity antenna. Insert the bare end of the wire in the PRX1 connector located in the middle of the board. As you move your finger near and far from the proximity detection antenna, the red and green LED turn on and off. The project includes the following user modules:

- **CSD**: This module is used to scan CapSense-based proximity sensor and determine the proximity of an object to the antenna.
- **LED**: LED is used to display the output based on the data from CapSense.
- **EzI2Cs**: The EzI2Cs module configures the PSoC on multifunction board as I2C slave. The slave data is available for acquisition using a bridge board that is configured as I2C master.

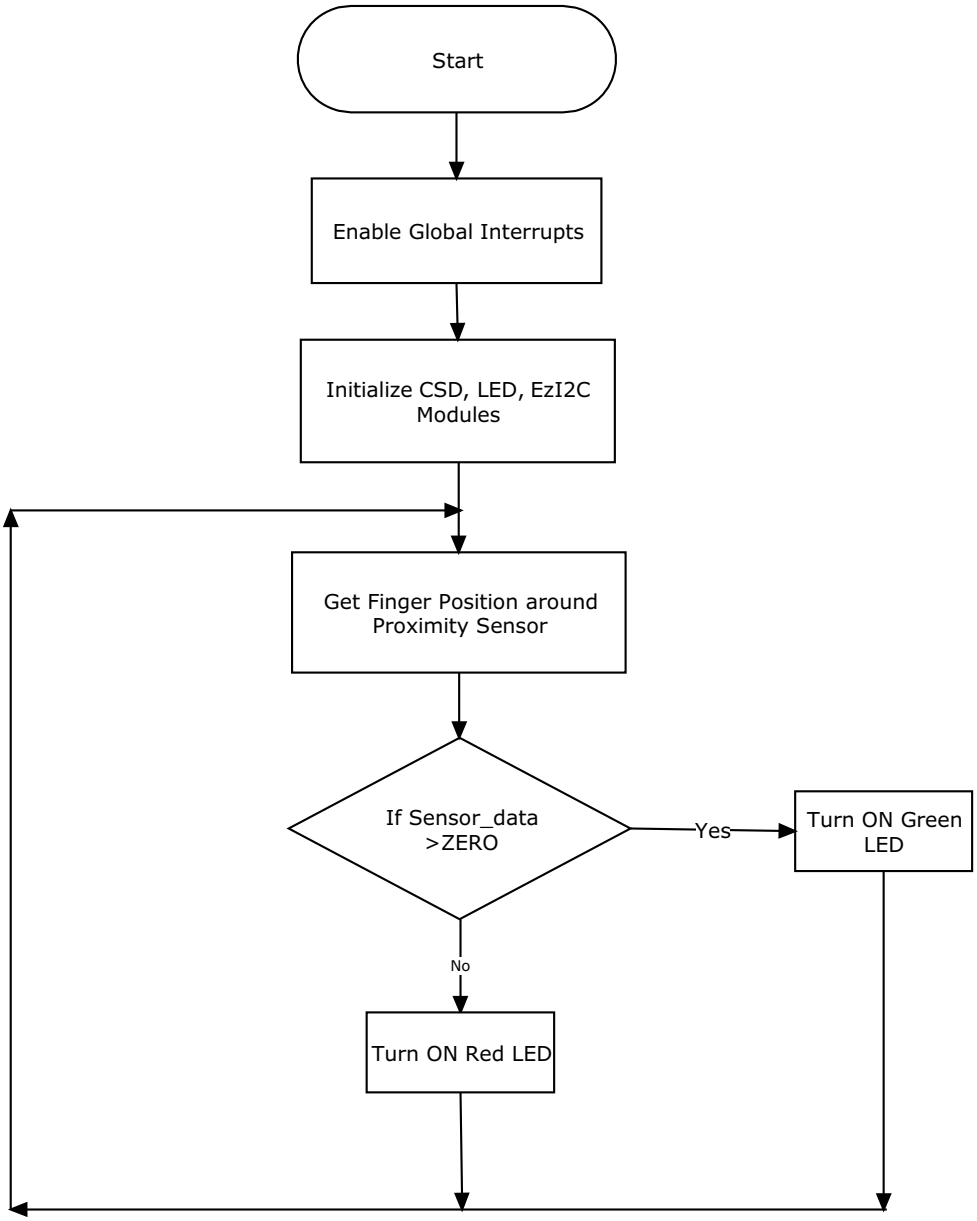
### 5.3.1 Device Configuration

The Chip Level View of the project after placing all the required user modules is shown in Figure 5-42.

Figure 5-42. Device Configuration of Proximity Sensor



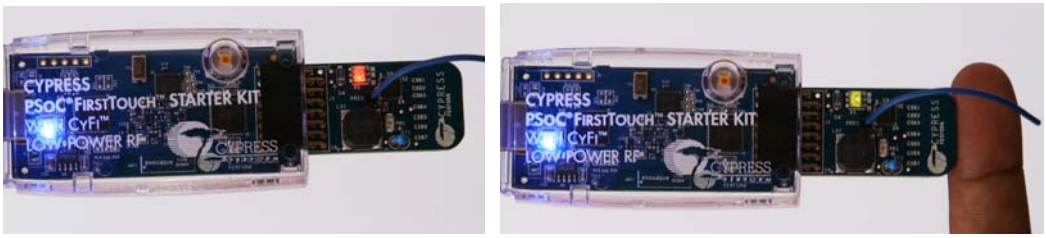
### 5.3.2 Flowchart



### 5.3.3 Verify Output

LED color changes to green when the finger is brought near the proximity antenna. LED color remains red when the finger is not present near antenna.

Figure 5-43. Proximity Antenna Output




To configure and connect FTMF board to the SCD and verify the output see Configuring Sense and Control Dashboard on page 15. Load *Template Proximity.node.xml* and view the output on the GUI.

Figure 5-44. Connect RF Expansion Board to 2x AAA Alkaline Battery and Multifunction Board

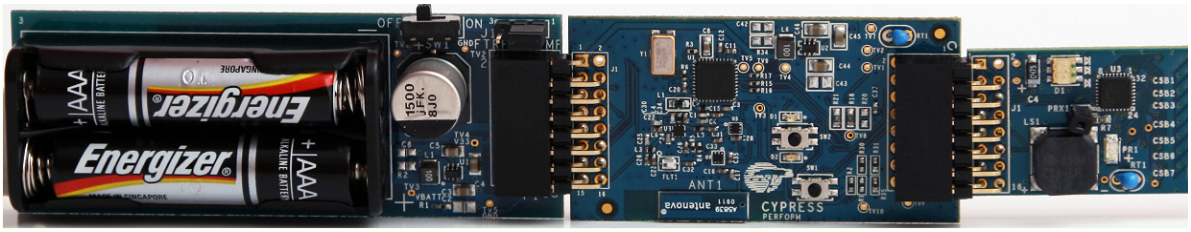
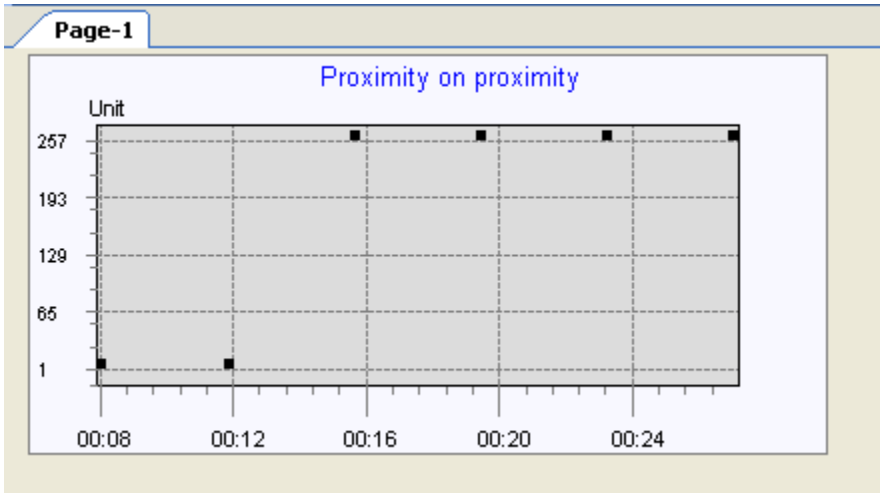



Figure 5-45. SCD Output



## 5.4 Multifunction Expansion Card Temperature Sensor

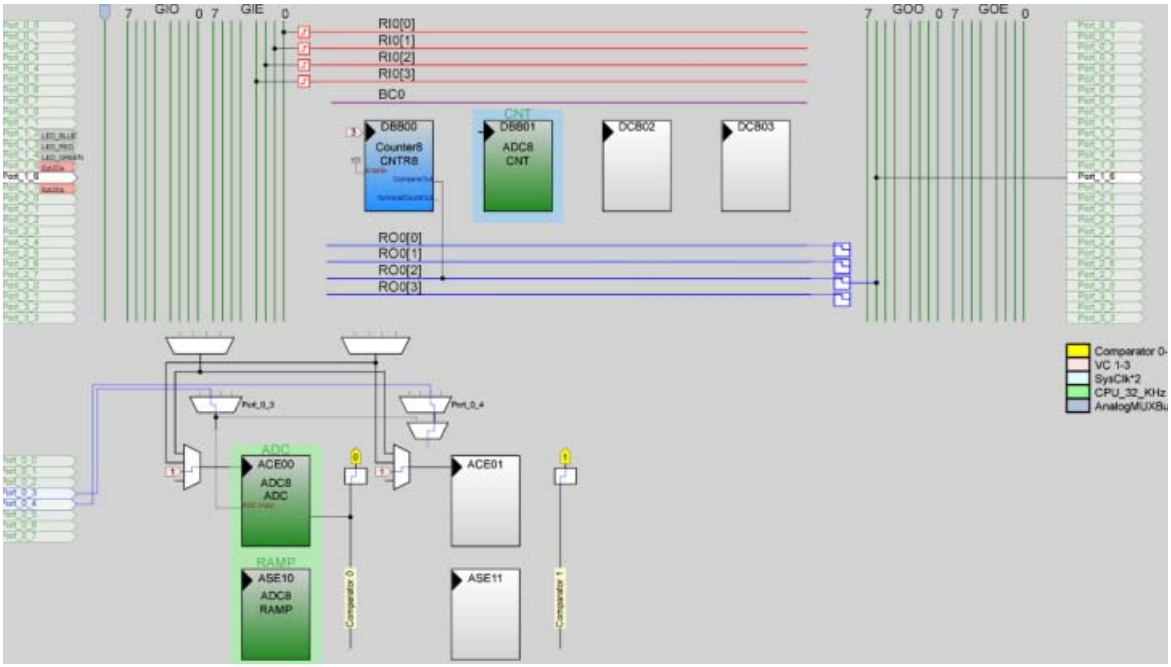
This project demonstrates the temperature sensing, thermistor reading, and calibrating capabilities of the PSoC device. Depending on the temperature range within which a particular temperature reading is recorded, different colored LEDs blink (red, green, and blue). When the temperature goes above or below a certain threshold, a buzzer is sounded out as an alert mechanism. The project includes the following user modules.

- **ADC**: This module converts analog input in digital form.The ADC module is used to obtain the digital values for the temperature.
- **LED**: This module is used to display the output based on the data from CapSense.
- **EzI2Cs**: The EzI2Cs module configures the PSoC on multifunction board as I2C slave. The slave data is available for acquisition using a bridge board that is configured as I2C master.

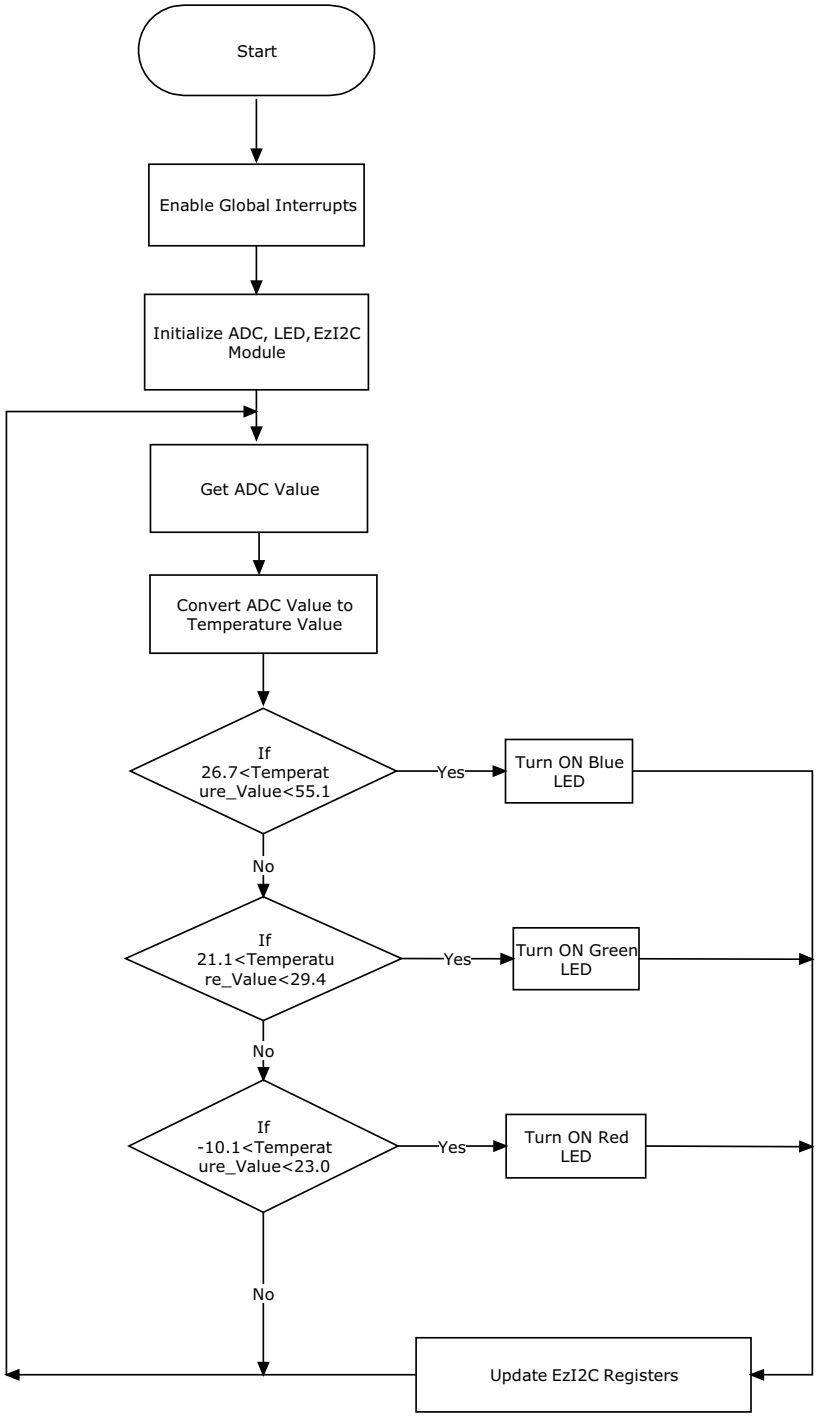
### 5.4.1 Device Configuration

The Chip Level View of the project after placing the required user modules is shown in Figure 5-46.

Figure 5-46. Device Configuration



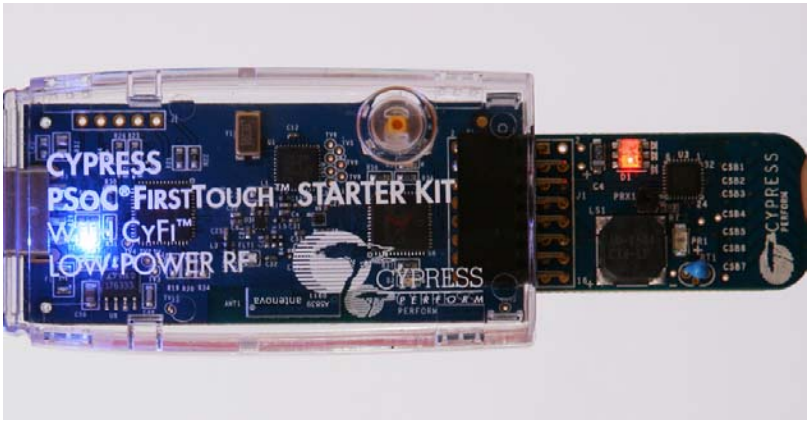
### 5.4.2 Flowchart



### 5.4.3 Verify Output

- The red LED is ‘On’ only if the temperature is between 28 °C and 55 °C.
- The green LED is ‘On’ only when the temperature is between 16 °C and 28 °C.
- The blue LED is ‘On’ only when the temperature is between 16 °C and –10.1 °C.

Figure 5-47. Temperature Reading and Updated LED Status




To configure and connect FTMF board to the SCD verify the output, see Configuring Sense and Control Dashboard on page 15. Load *Template Temperature.node.xml* and view the output on the GUI.

Figure 5-48. Connect RF Expansion Board into 2x AAA Alkaline Battery and Multifunction Board

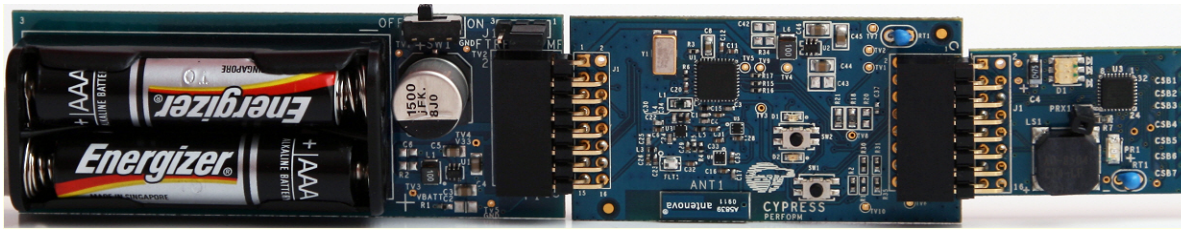
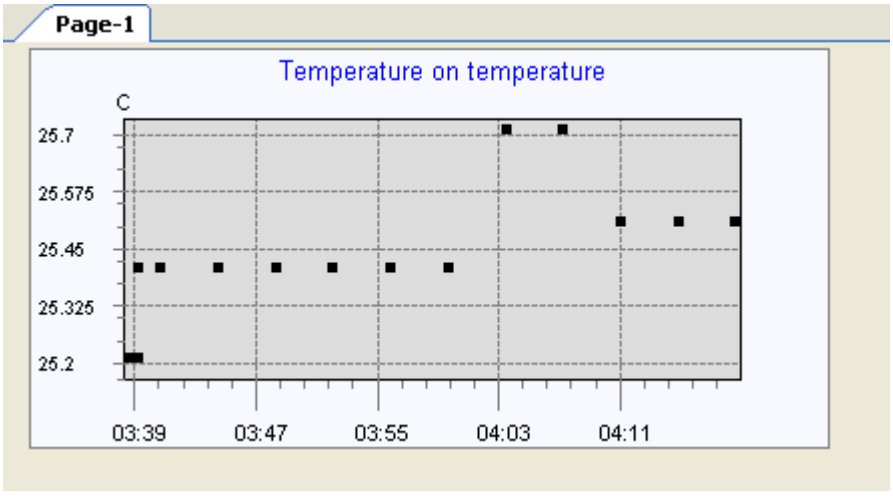



Figure 5-49. SCD Output



## 5.5 Ultra Low Power Wireless Temperature Sensor (RF_ULP_TEMP)

### 5.5.1 Project Description

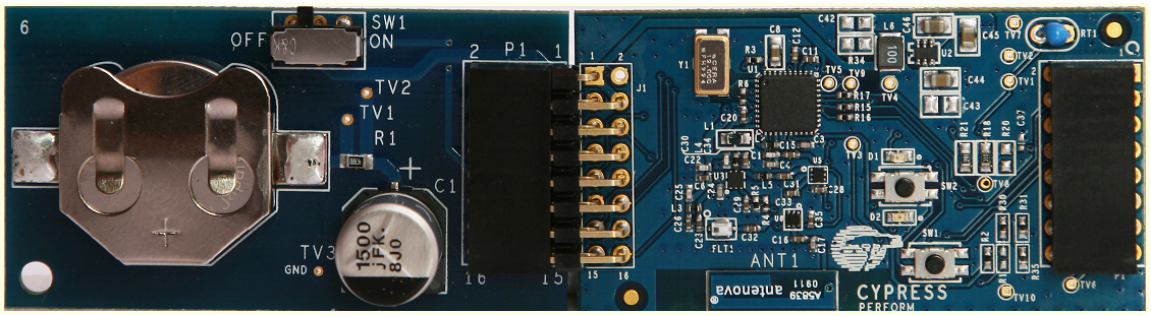
This project demonstrates how the hub board connects to an RF expansion board driven by AAA/ CR-2032 coin cell. The RF expansion board transmits temperature data acquired from an onboard thermistor. The hub receives this data and sends it to the host PC, which displays the temperature data in text or graph form on the SCD. The project includes the following user modules:

- **CYFISNP:** This module implements the entire star network wireless protocol and all protocol modes, in addition to low level radio communication and radio control by the MCU.
- **ADCINC:** The incremental ADC is used to calculate counts proportional to the voltages at P0.0 and P0.1. These values are used to measure the ambient temperature.
- **DigBuf:** This module generates an interrupt on the rising edge of Output1.
- **PGA:** This module facilitates the route ability of the analog inputs to the ADC analog block.
- **TX8:** This module is used for serial communication with host and for debugging.
- **Timer8:** This module implements an 8-bit timer that is clocked by a divider of SysClk. It is used to calibrate the sleep timer that is clocked by the 32 kHz system oscillator.

### 5.5.2 Hardware Connections

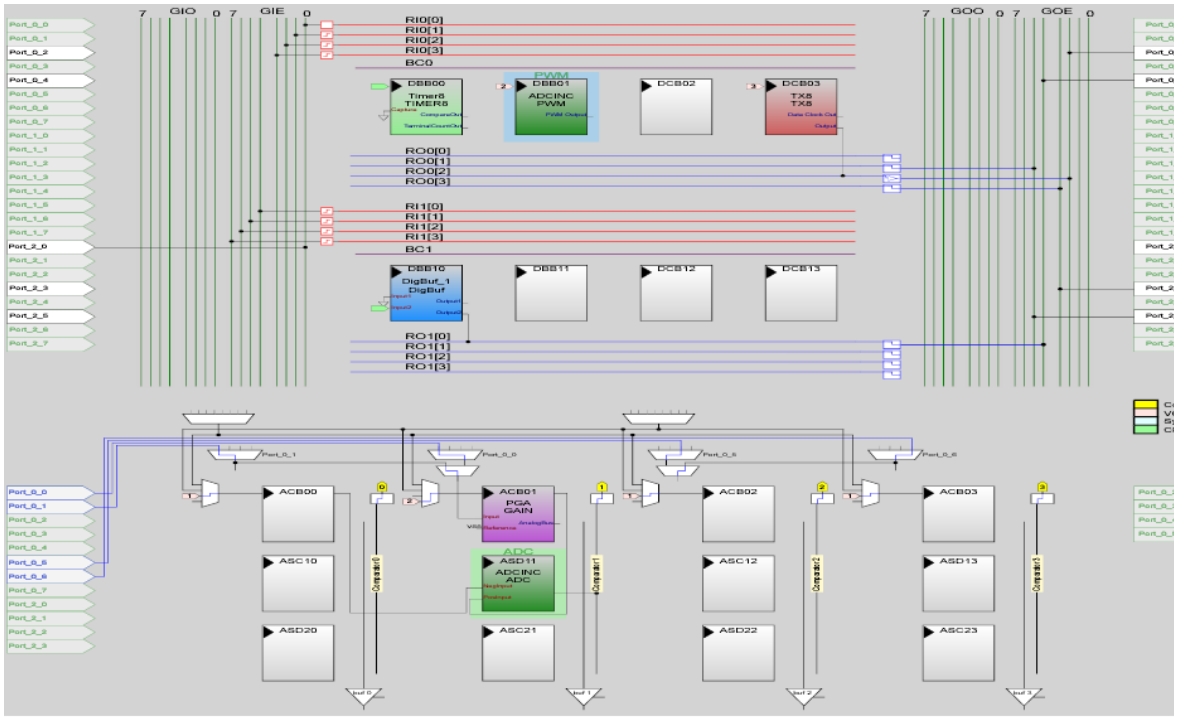
This demonstration showcases a low power RF solution that runs on a coin cell. It operates at 0 dBm RF power output.

Figure 5-50. Connect RF Expansion Board to CR-2032 Coin Cell

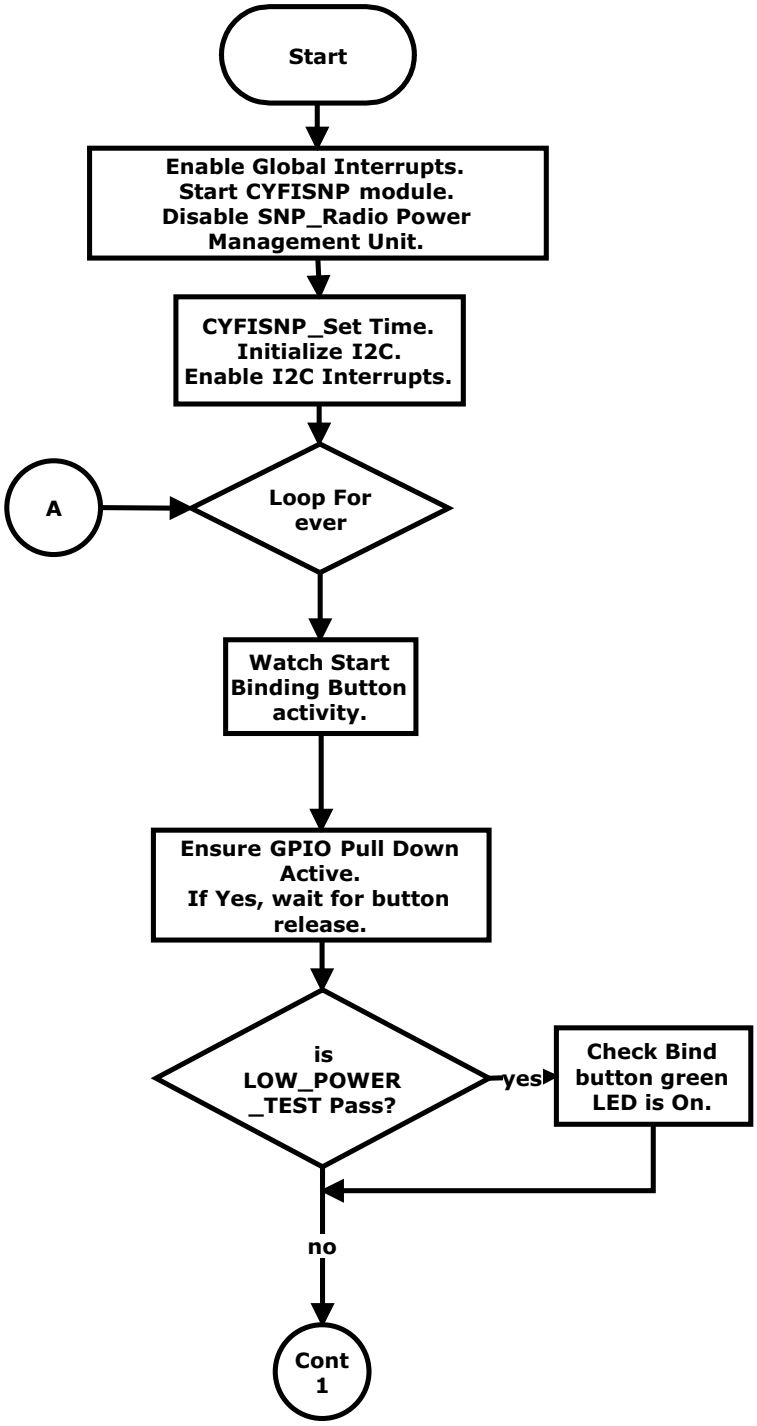


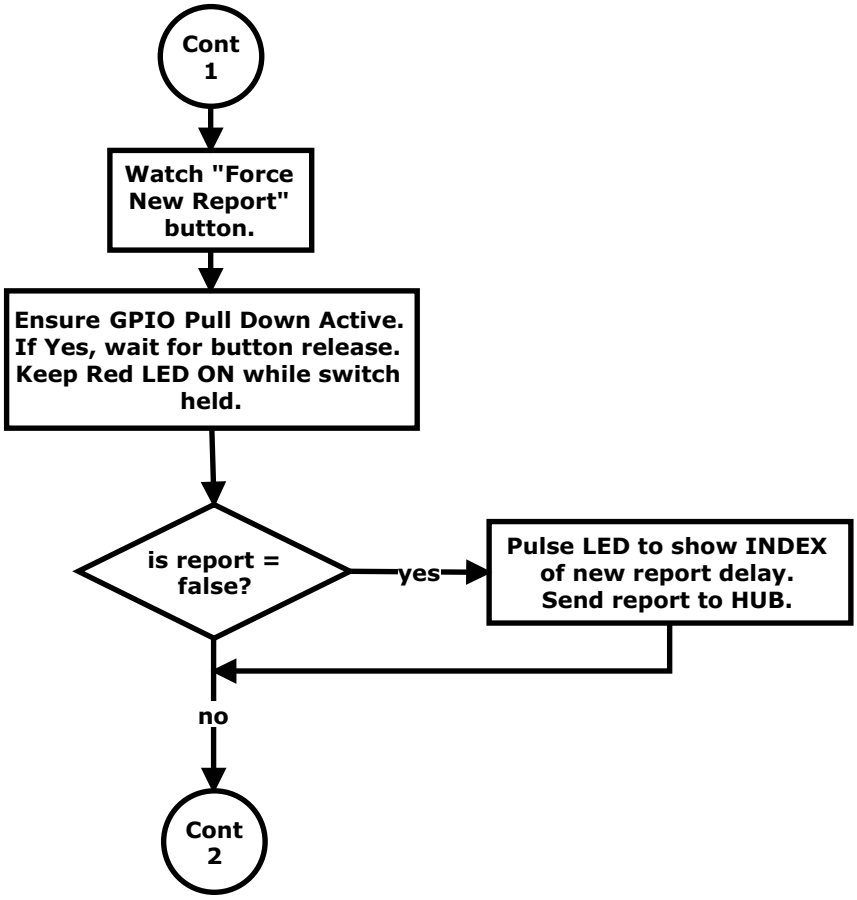
## 5.5.3 Device Configuration

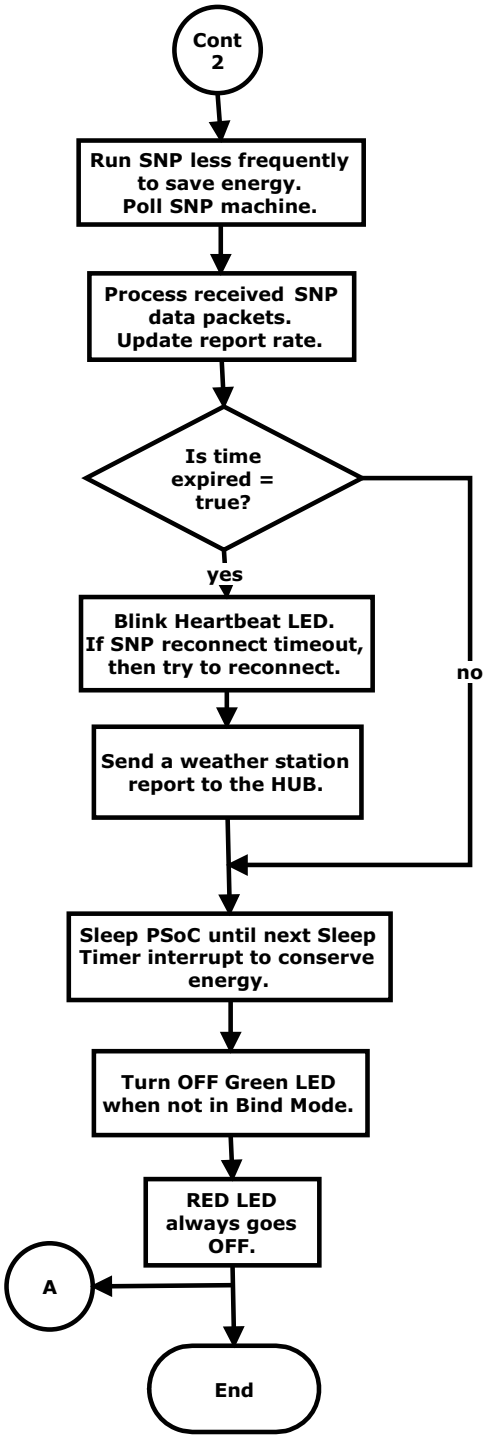
Figure 5-51. Device Configuration



### 5.5.4 Flowchart




Cont
1
Watch "Force
New Report"
button.
Ensure GPIO Pull Down Active.
If Yes, wait for button release.
Keep Red LED ON while switch
held.
is report =
false?
yes
Pulse LED to show INDEX
of new report delay.
Send report to HUB.
no
Cont
2

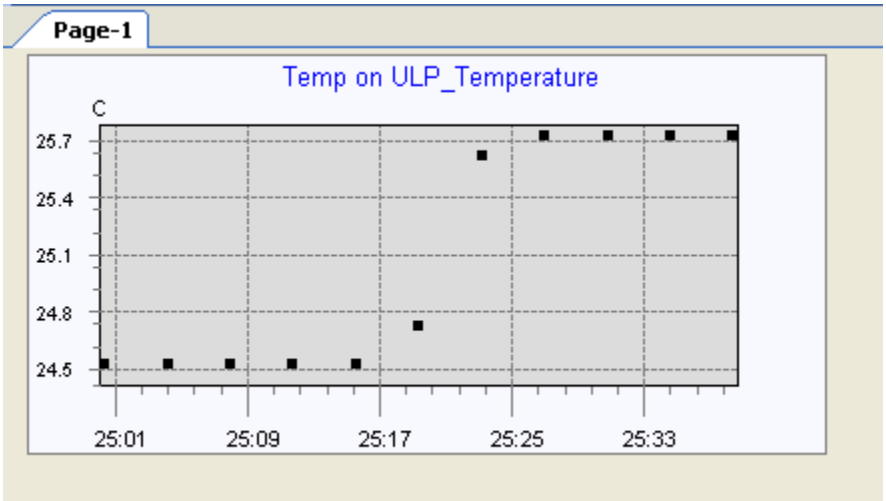



### 5.5.5 Verify Output

1. Connect the PC dongle to a free USB port of the PC.
2. Connect the FTRF board to the PC dongle.
3. Program the FTRF board with RF_ULP_TEMP.hex.

4. On programming the board successfully, disconnect it from the PC dongle and connect to CR2032 power pack board.
5. Insert the coin cell into the CR2032 power pack board with '+' upwards.
6. Slide the switch SW1 on the board to 'ON' position.
7. To configure and connect FTRF board to the SCD and verify the output, see Configuring Sense and Control Dashboard on page 15. Load *Template ULP Temp Sensor.node.xml* and view the output on the GUI.

Figure 5-52. SCD Output




## 5.6 PC Bridge Wireless HUB

The PC bridge consists of two CY8C24894 processors. One device is used for the master microprocessor that provides USB to I2C bridge functionality in addition to programming support for all kit elements. The second CY8C24894 processor acts as the wireless hub and communicates with the SCD application via an I2C interface to the master processor USB/I2C bridge. This section discusses the architecture, firmware source code modules, and configuration options for the slave process or the wireless hub application processor.

The slave CY8C24894 is configured using the Device Editor in PSoC Designer. The bridge uses the CYFISNP, EzI2Cs, LEDs (red and green), and TX8 user modules. The Wireless Hub application uses the CyFiSNP user module configured as a hub to communicate with the wireless nodes. All configuration and node data is communicated over a I2C interface.

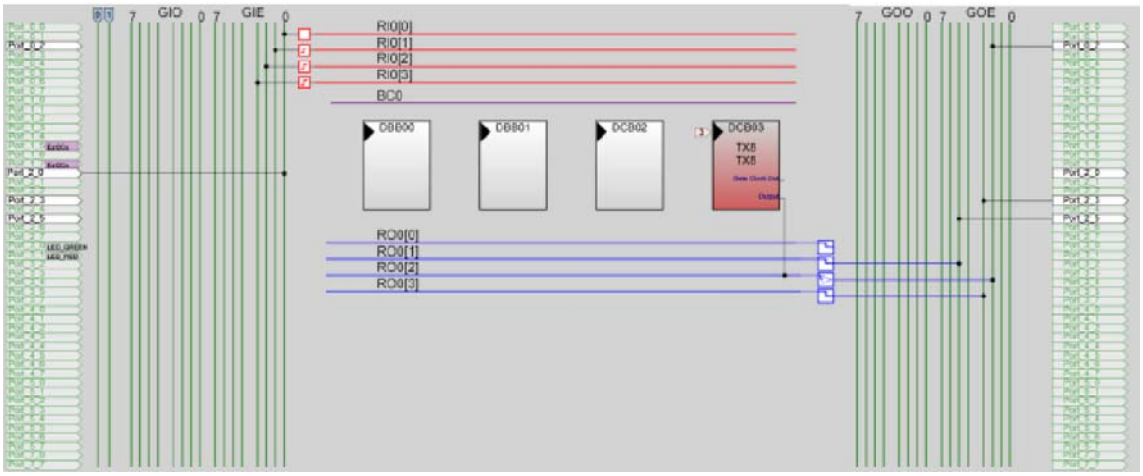
### 5.6.1 Device Configuration for Slave CY8C24894

The Chip Level View of the project after placing the required user modules is shown in Figure 5-53.

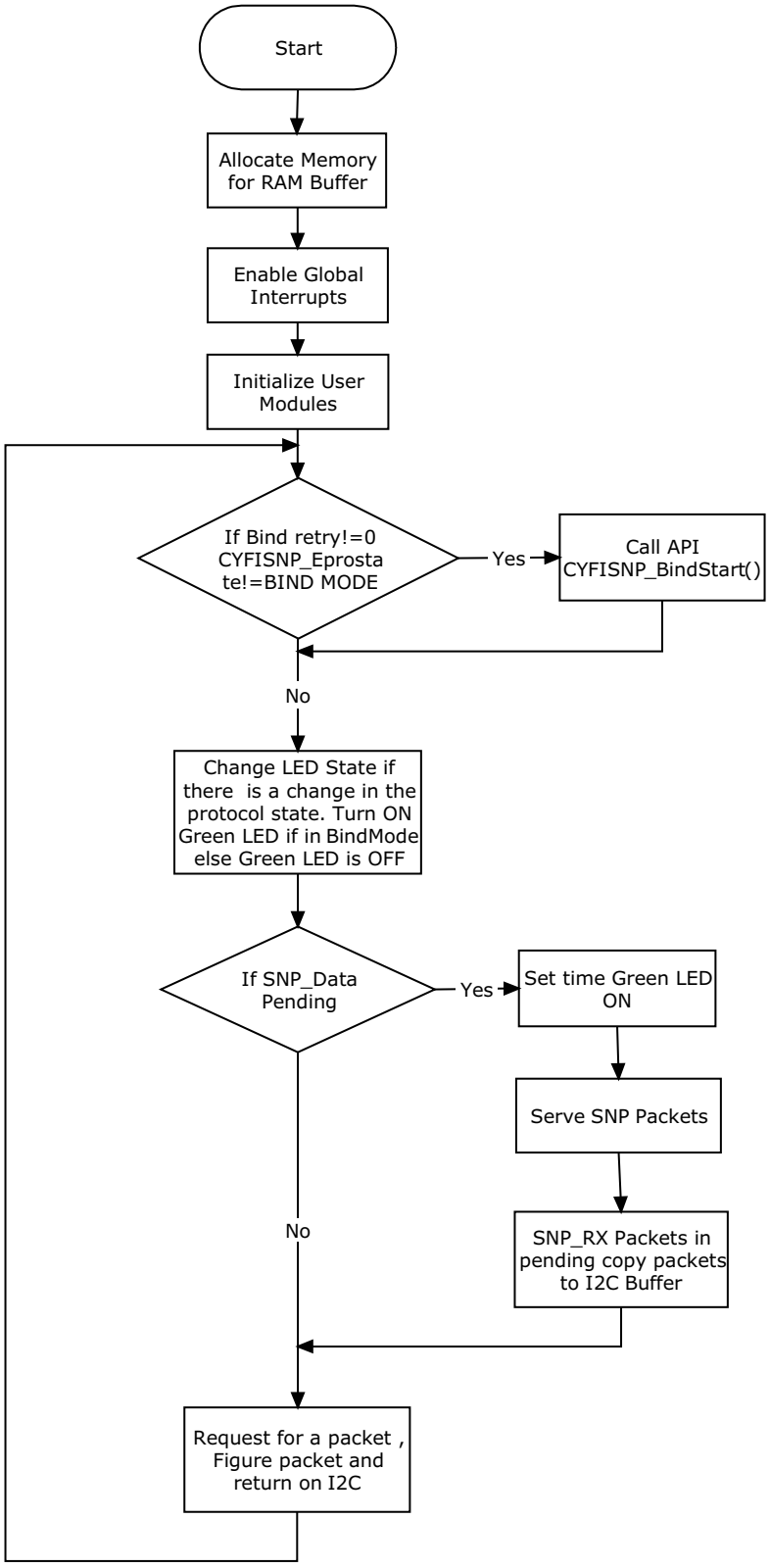
- **CYFISNP:** This user module implements the entire Star network wireless protocol and all protocol modes, in addition to low level radio communication and radio control by the MCU.
- **EzI2Cs:** This user module implements the I2C slave functionality and takes care of data communication through the I2C interface with the master CY8C24894.
- **LED:** There are two instances of this user module - one is configured as RED and the other as GREEN. These implement the API to turn on and off the LEDs according to the needs of the application. The application firmware can call simple APIs to manipulate the LEDs.
- **TX8:** This module is used for serial communication with host and for debugging.

## 5.6.2 Device Configuration

Figure 5-53. Device Configuration for PC Bridge Wireless HUB



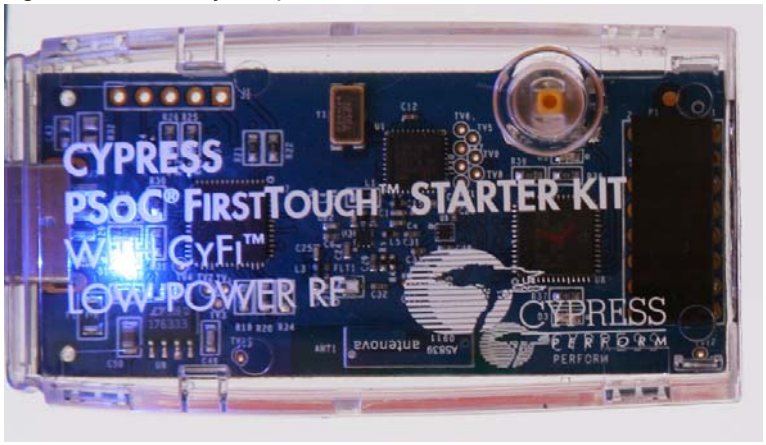
### 5.6.3 Flowchart



### 5.6.4 Verify Output

Connect the PC dongle to a free USB port in the PC. On successful programming of the board, the blue LED starts blinking

Figure 5-54. Verify Output




## 5.7 Wireless I2C Bridge for RF Expansion Card

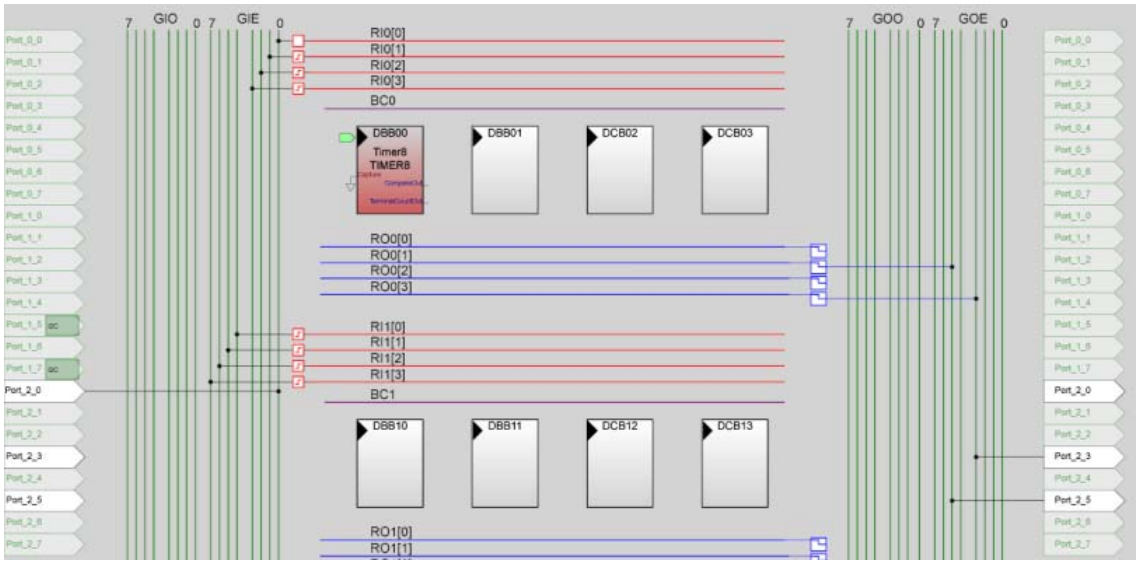
This project demonstrates the firmware implementation when using the RF expansion board as an I2C bridge to retrieve data packets from an external board and transmit data back to the central hub. The CY3271-FTRF kit uses a PSoC CY8C27443 on the RF expansion board. This application processor controls the CyFi Radio and the other components on the board. The project includes the following user modules.

**Timer8:** This user module implements an 8-bit timer that is clocked by a divider of SysClk. This is used to calibrate the sleep timer that is clocked by the 32 kHz system oscillator.

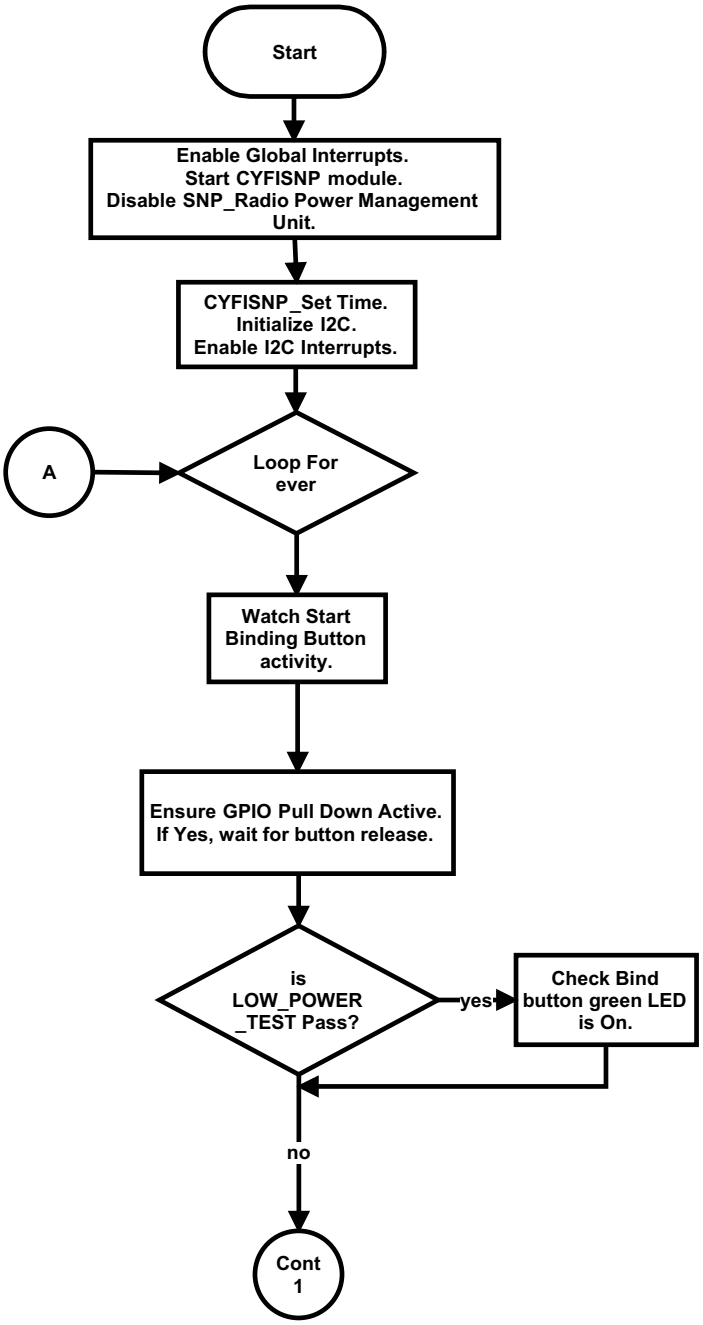
**I2C:** This module transfers data between the RF expansion board and the add-on board connected externally.

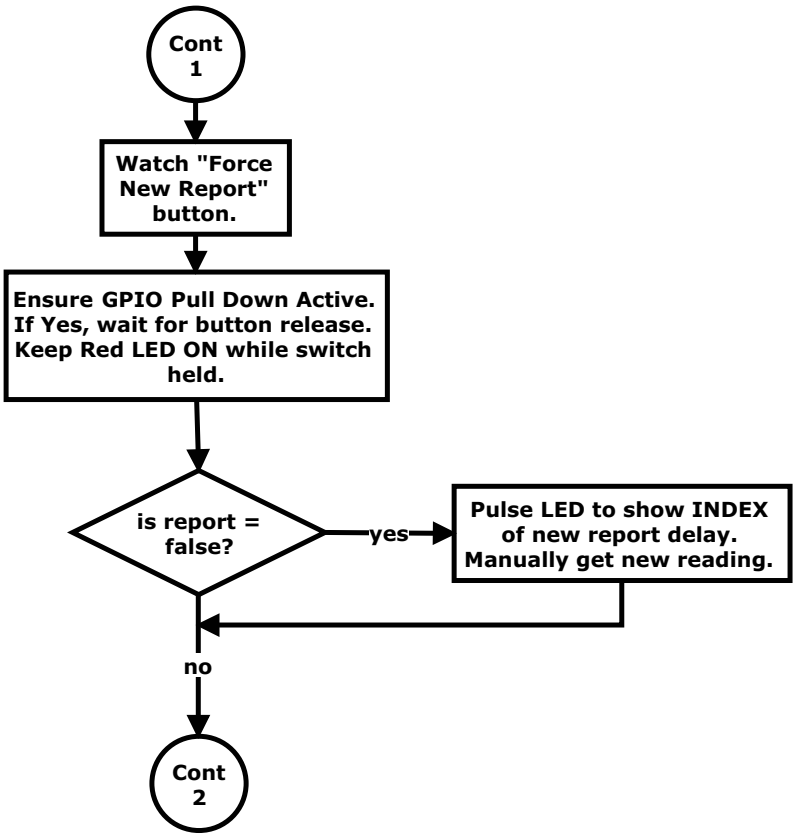
### 5.7.1 Device Configuration

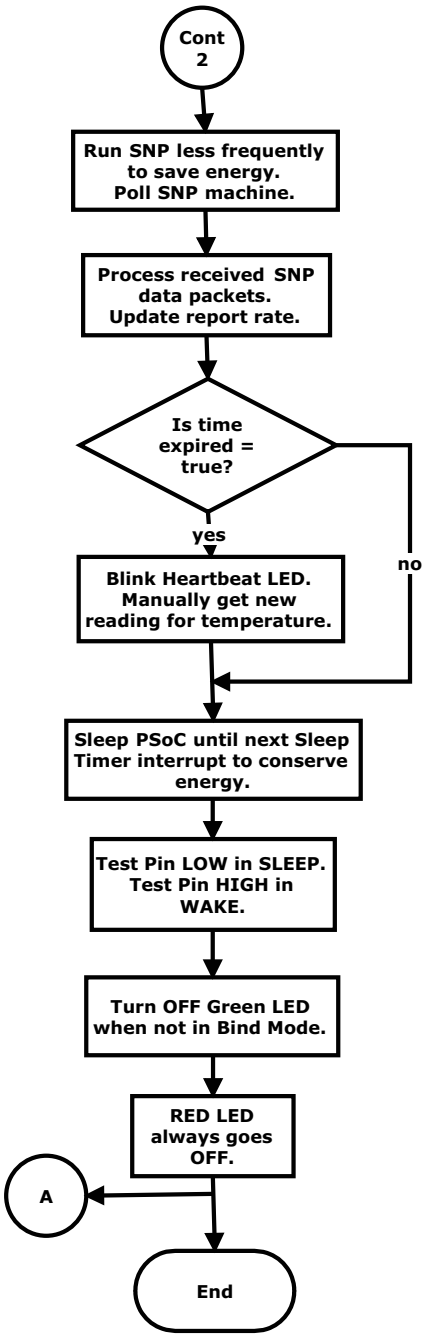
Figure 5-55. Device Configuration showing Project Placement



### 5.7.2 Flowchart



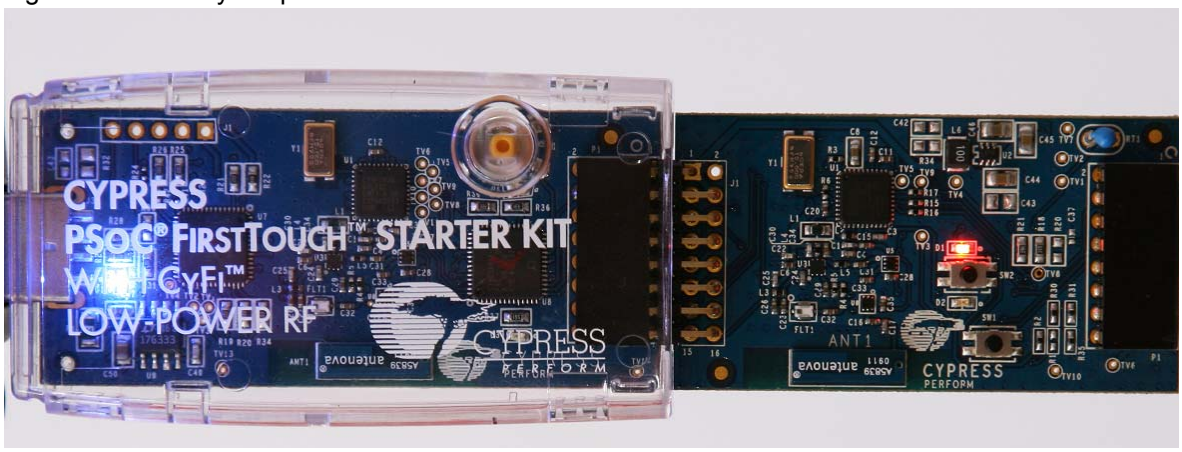

Cont 1
Watch "Force New Report" button.
Ensure GPIO Pull Down Active. If Yes, wait for button release. Keep Red LED ON while switch held.
is report = false?
yes
Pulse LED to show INDEX of new report delay. Manually get new reading.
no
Cont 2


Cont 2
Run SNP less frequently to save energy. Poll SNP machine.
Process received SNP data packets. Update report rate.
Is time expired = true?
yes
no
Blink Heartbeat LED. Manually get new reading for temperature.
Sleep PSoC until next Sleep Timer interrupt to conserve energy.
Test Pin LOW in SLEEP. Test Pin HIGH in WAKE.
Turn OFF Green LED when not in Bind Mode.
RED LED always goes OFF.
A
End

### 5.7.3 Verify Output

When the RF board is connected to the PC dongle, the red LED on the board starts blinking.

Figure 5-56. Verify Output



# A. Appendix

The schematic and board layouts are available on the CY3271-FTRF kit CD are at the following location: `<Install_Directory>:\Cypress\CY3271-FTRF\<version>\Hardware`.

## A.1 Schematics

Figure A-1. PC Bridge Schematic

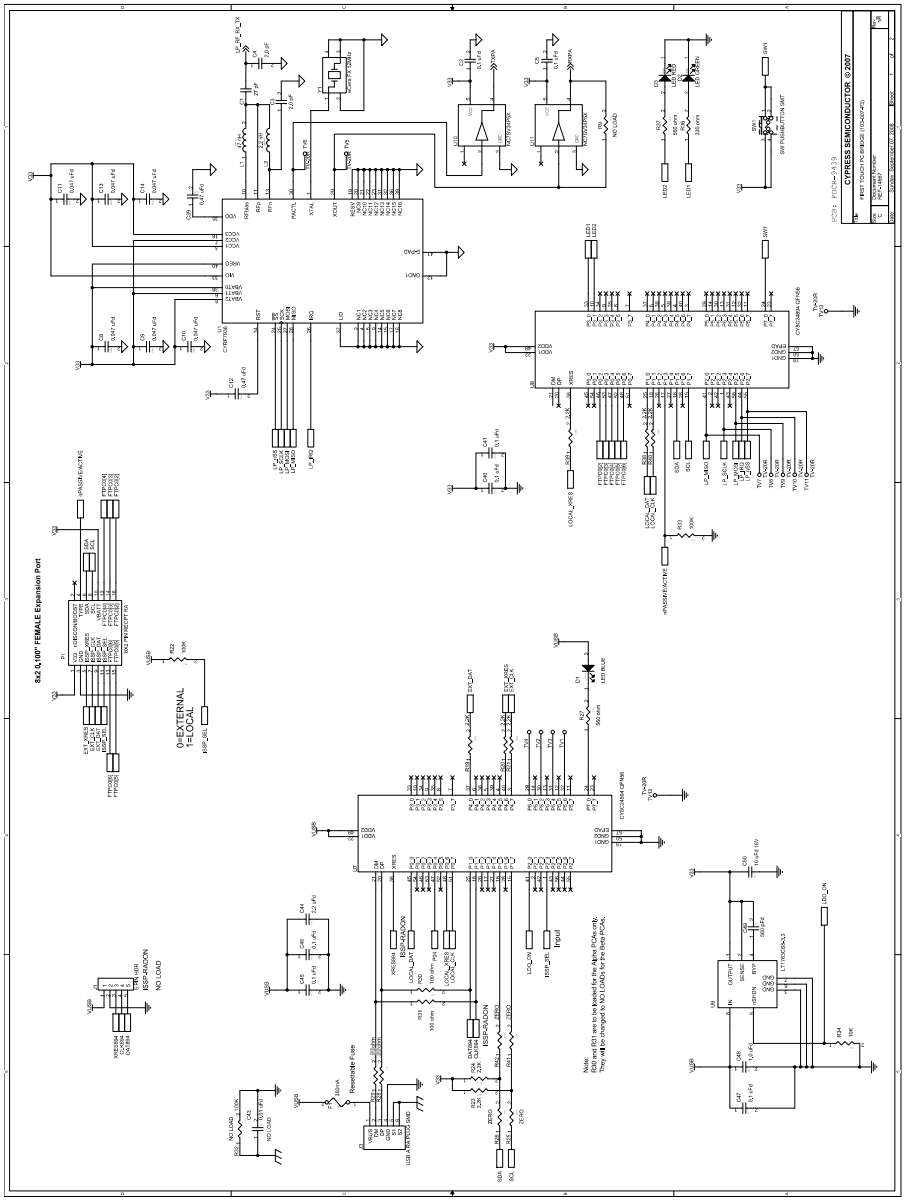


Figure A-2. PC Bridge Schematic

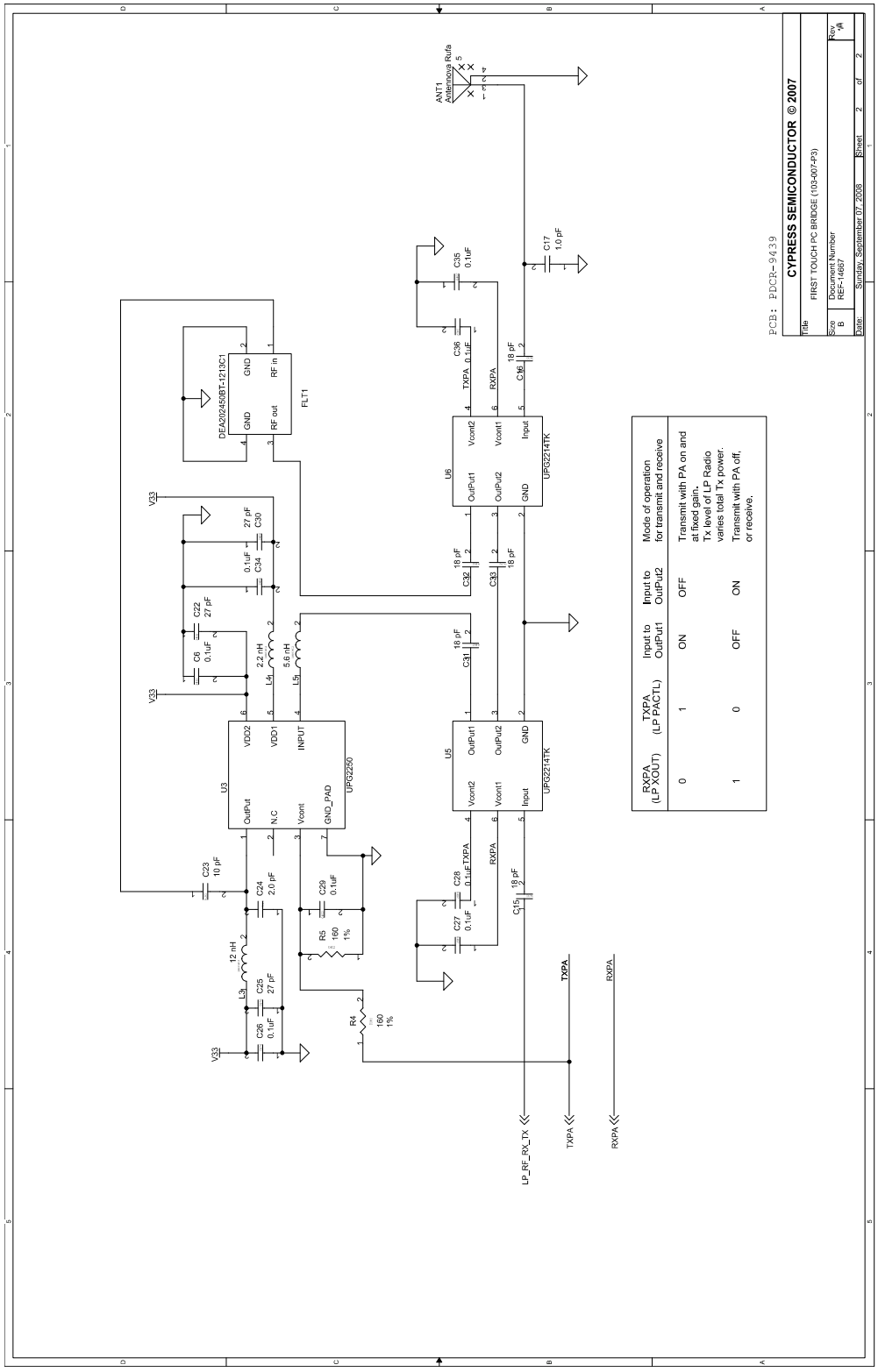


Figure A-3. RF Expansion Card Schematic

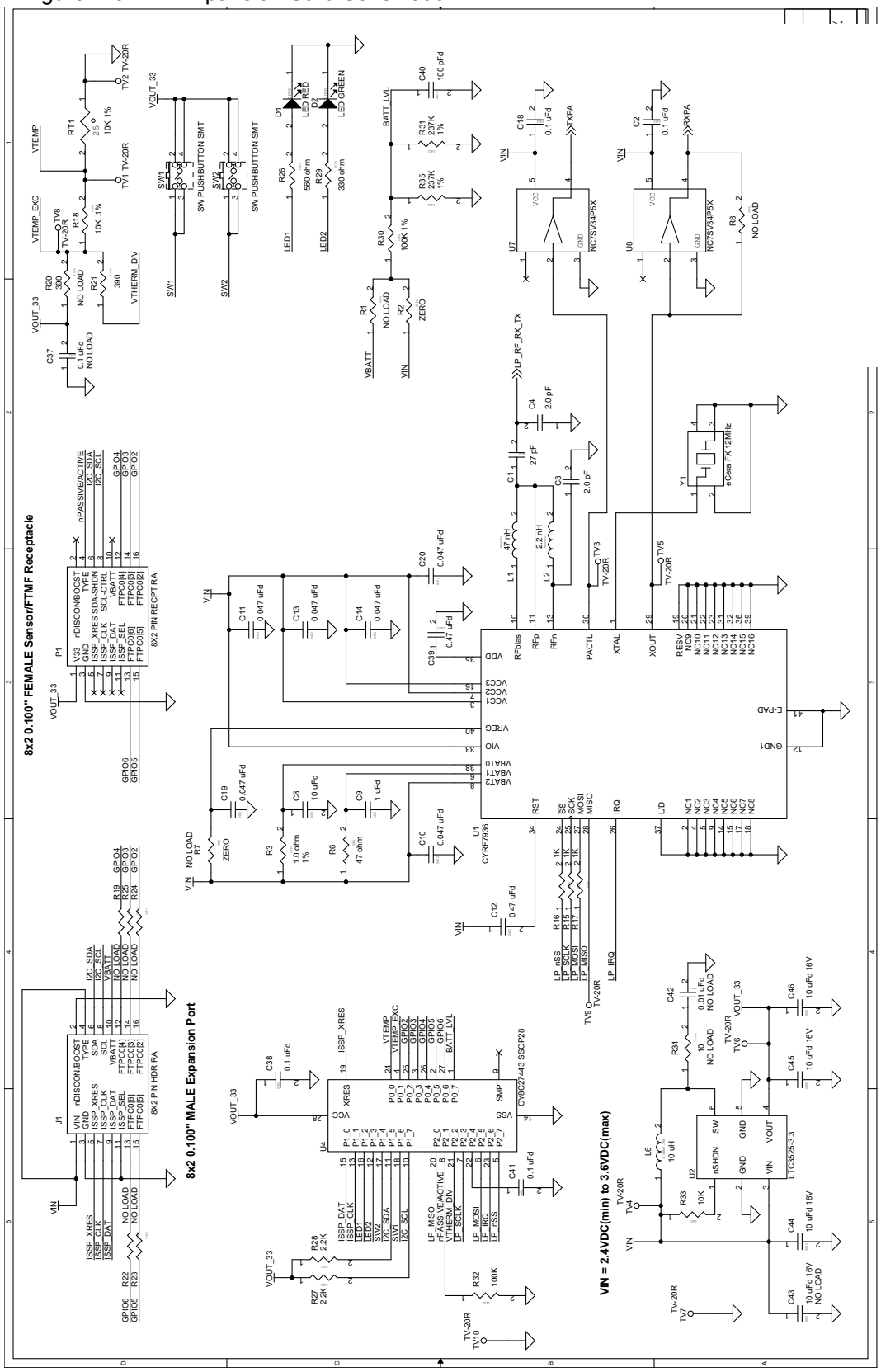


Figure A-4. RF Expansion Schematic

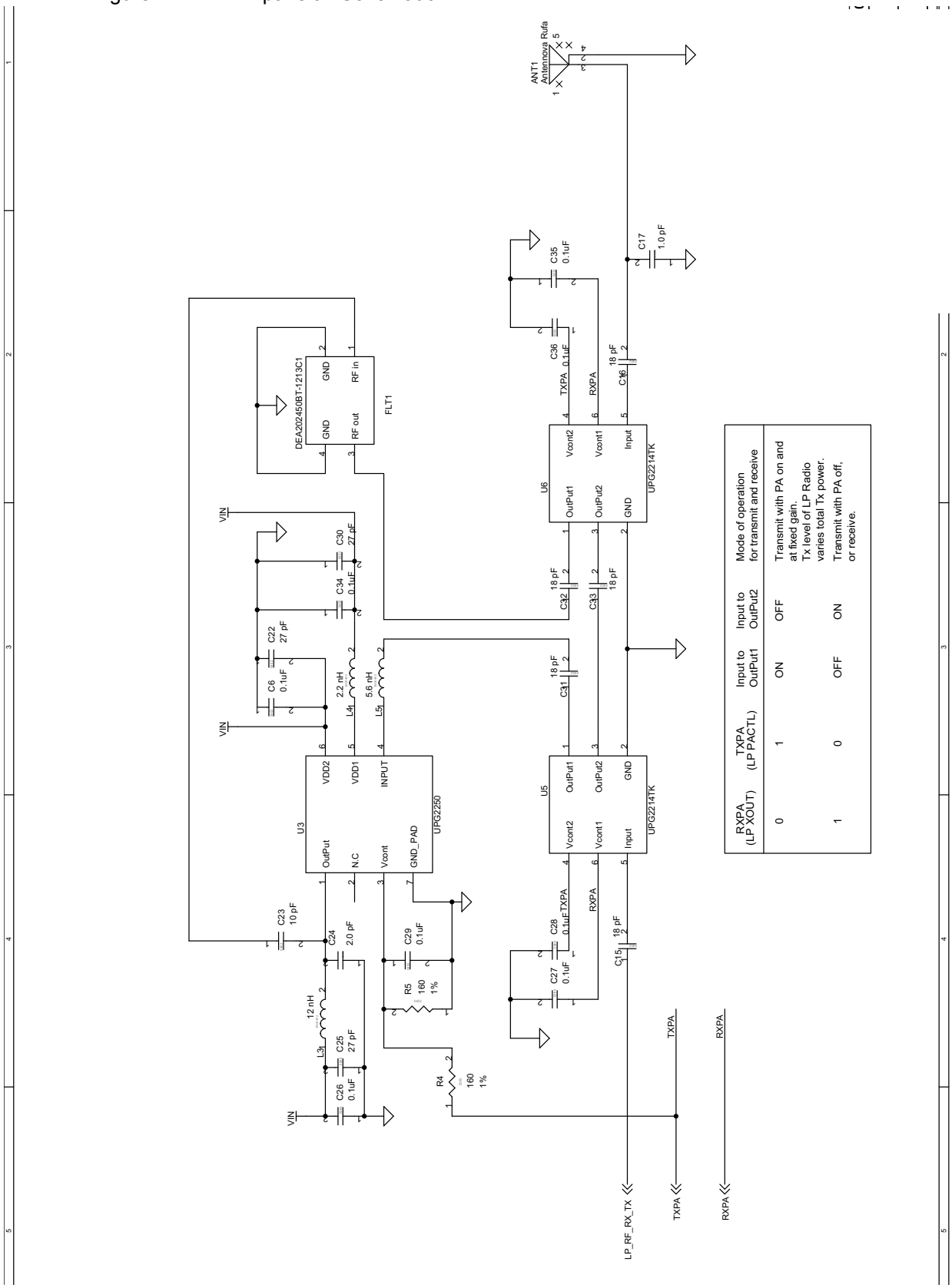


Figure A-5. FTMF Expansion Card Schematic

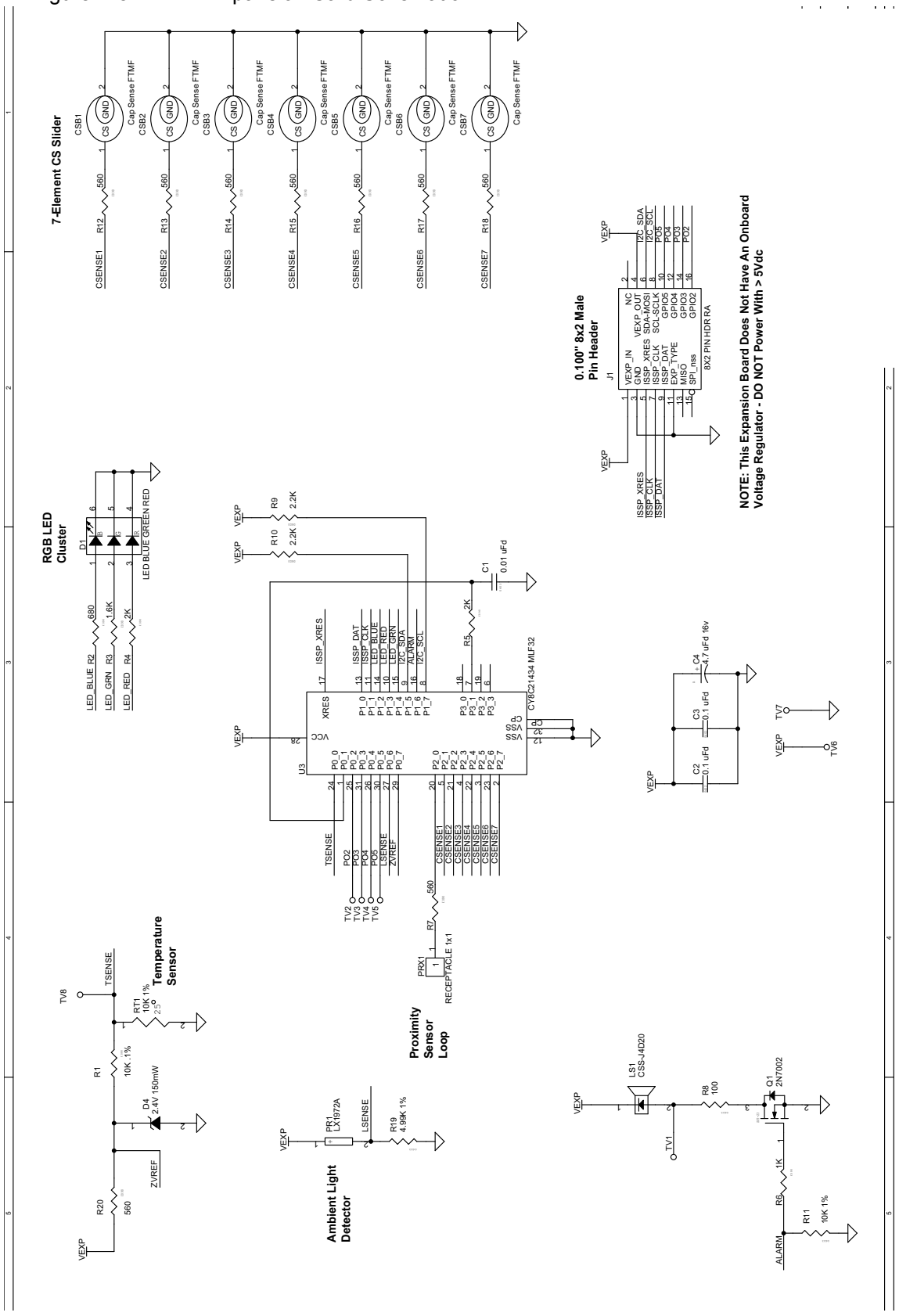


Figure A-6. AAA Power Pack Schematic

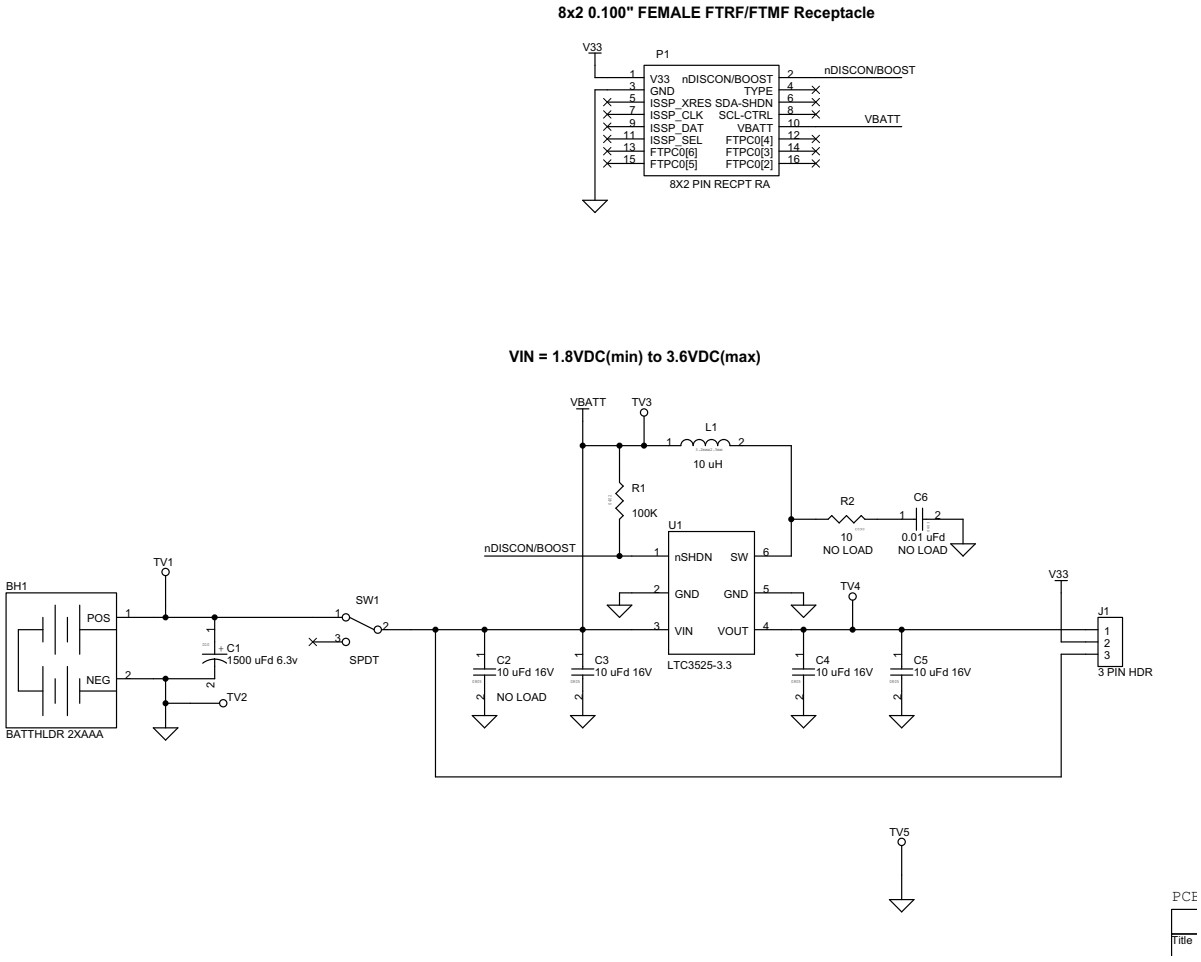
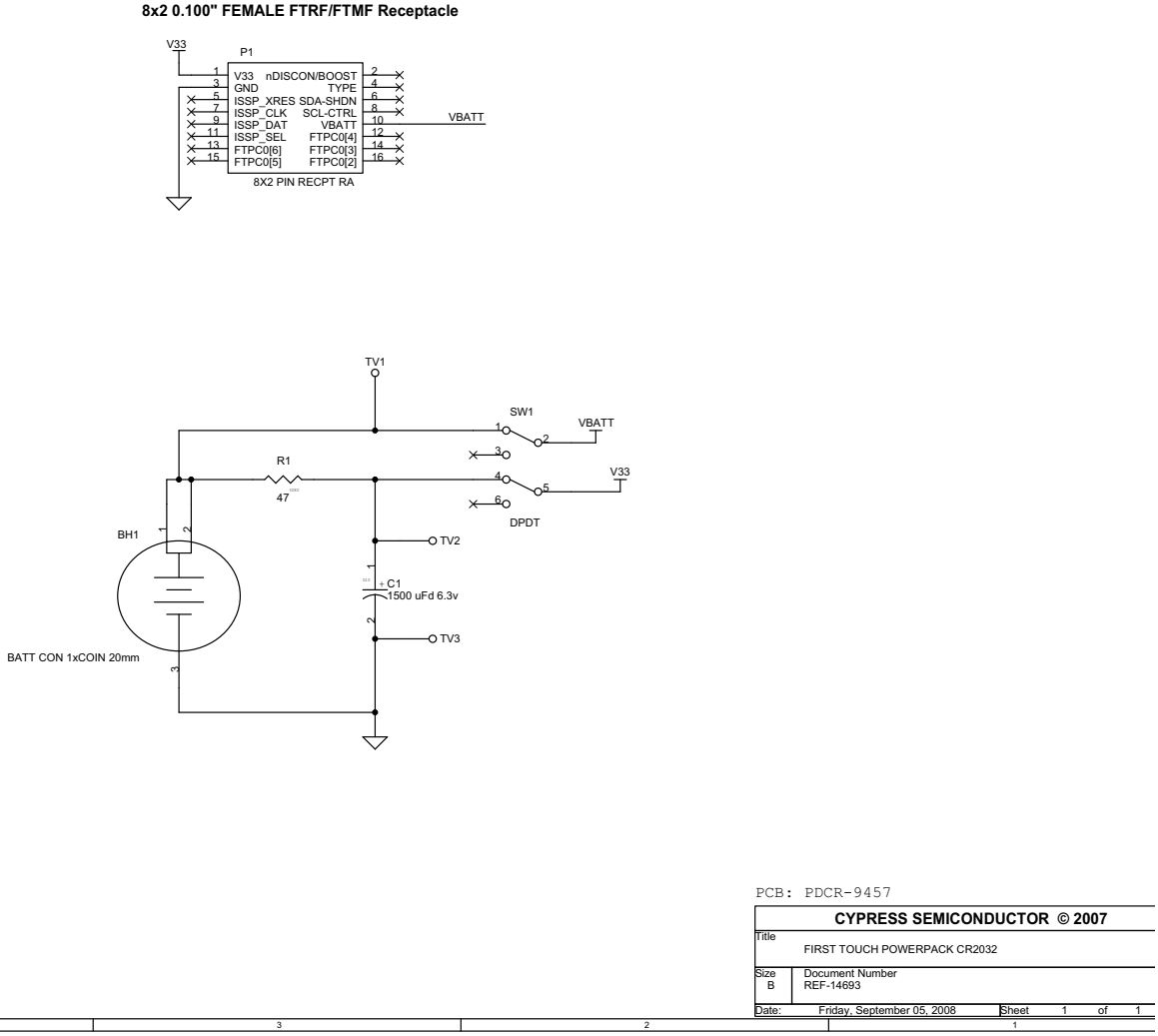


Figure A-7. CR2032 Power Pack Schematic



## A.2 PC Bridge Layout

Figure A-8. PC Bridge Top View

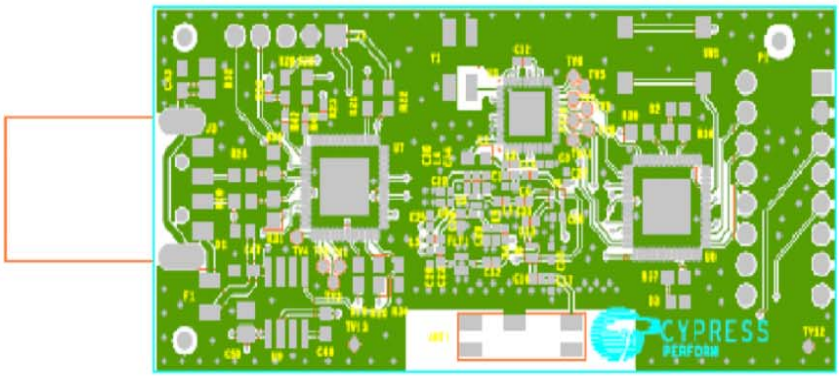
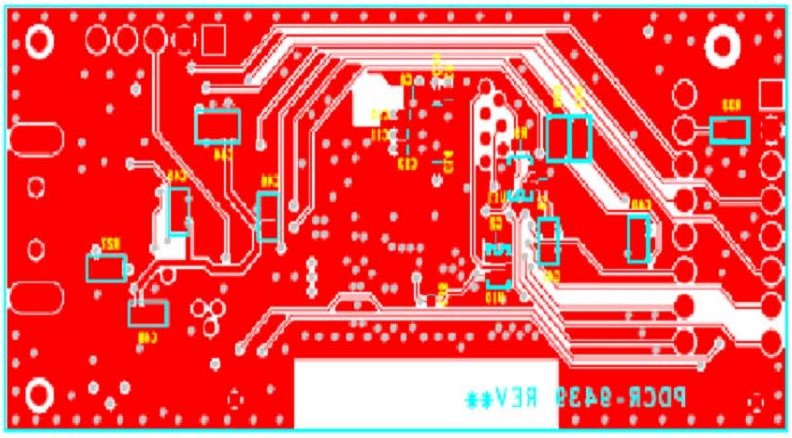


Figure A-9. PC Bridge Bottom View



## A.3 RF Expansion Layout

Figure A-10. RF Expansion Top View

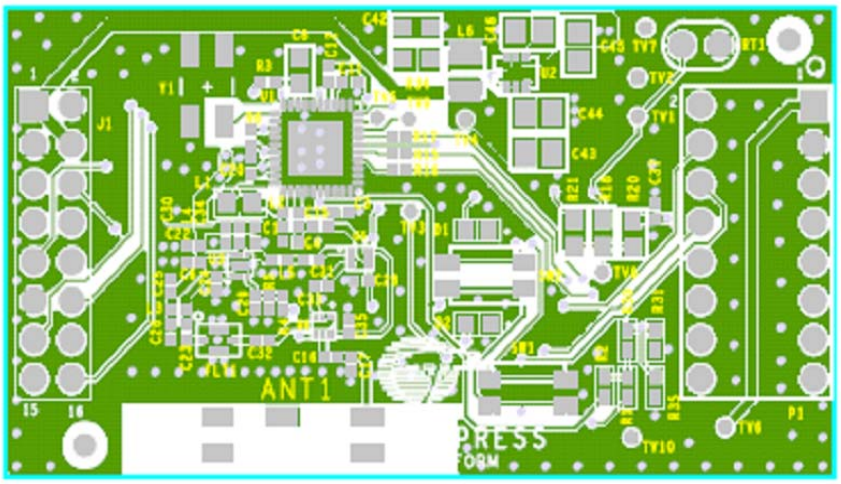
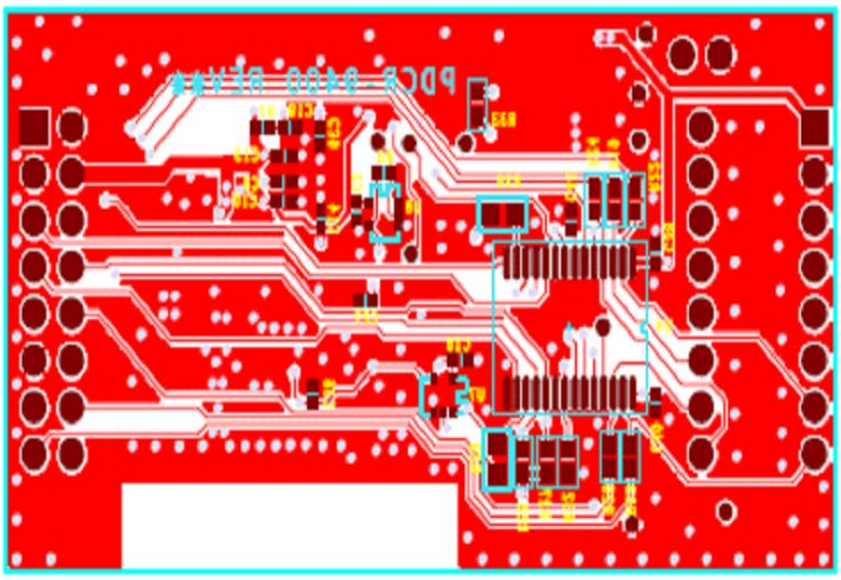



Figure A-11. RF Expansion Bottom View



## A.4 MF Expansion Layout

Figure A-12. Multifunction Expansion Top View

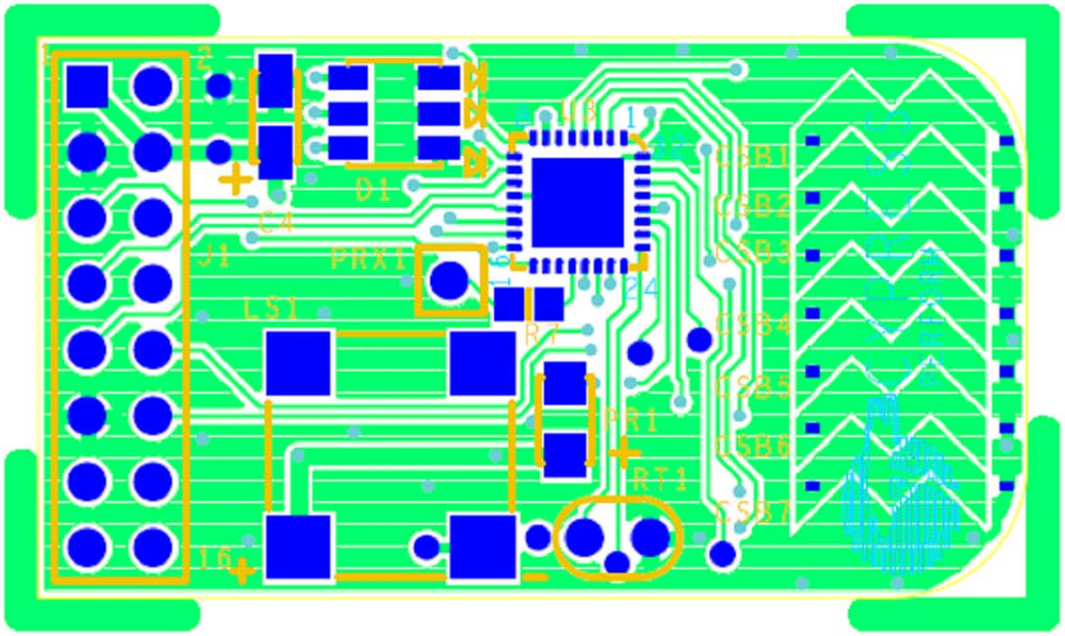
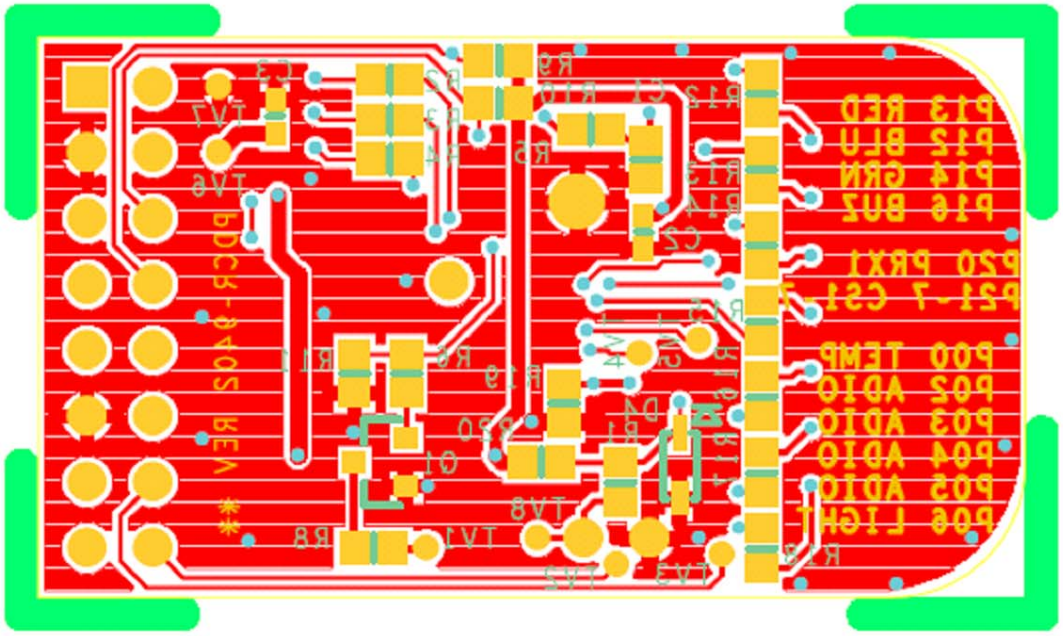


Figure A-13. Multifunction Expansion Bottom View



## A.5 AAA Battery Layout

Figure A-14. AAA Battery Top View

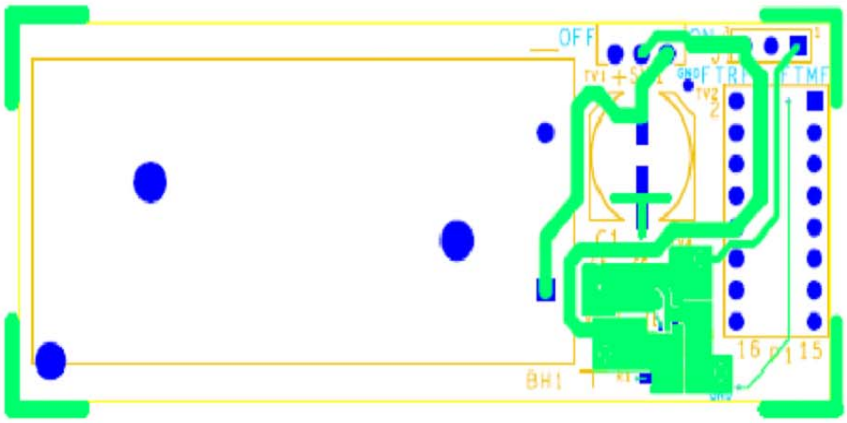
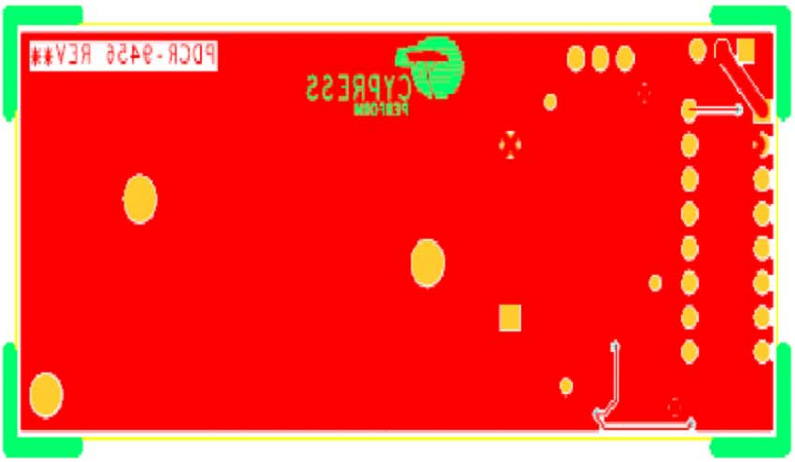


Figure A-15. AAA Battery Bottom View



## A.6 Coin Battery Layout

Figure A-16. Coin Battery Top View

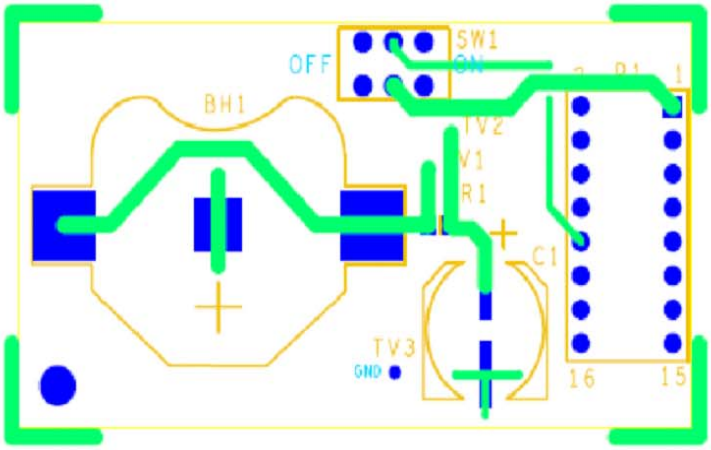
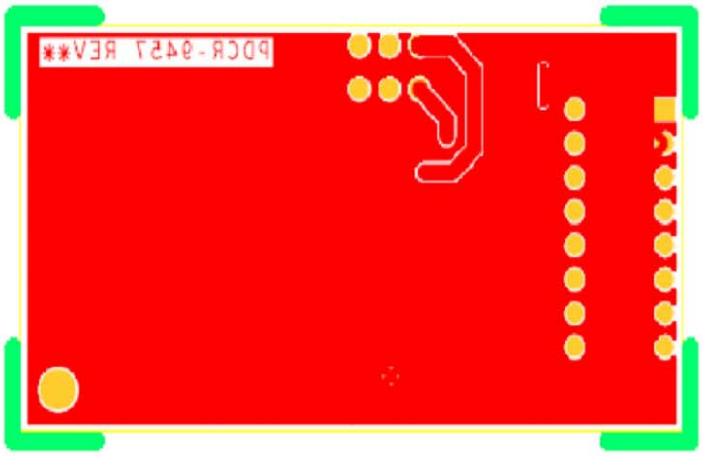



Figure A-17. Coin Battery Bottom View



## A.7 Bill of Materials (BOM)

Table A-1. PC Bridge BOM

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| | | | PCB | Cypress | PDCR-9439 |
| 1 | 1 | ANT1 | ANTENNA CHIP 2.4GHZ SMD LEFT FD | Antenova | 3030A5839-01 |
| 2 | 4 | C1,C22,C25,C30 | CAP 27PF 50V CERAMIC NPO 0402 | Kemet | C0402C270J5GACTU |
| 3 | 2 | C2,C5 | CAP .10UF 10V CERAMIC X5R 0402 | Kemet | C0402C104K8PACTU |
| 4 | 3 | C3,C4,C24 | CAP CER 2PF 50V S 0402 UHI Q | Johanson | 500R07S2R0BV4T |
| 5 | 8 | C6,C26,C27,C28,C29,C34, C35,C36 | CAP 0.1 uF 10% 10V CERAMIC X5R 0402 | Panasonic - ECG | ECJ-0EB1A104K |
| 6 | 6 | C8,C9,C10,C11,C13,C14 | CAP CERM .047UF 10% 16V X5R 0402 | AVX | 0402YD473KAT2A |
| 7 | 2 | C12,C39 | CAP CER .47UF 6.3V X5R 0402 | Murata | GRM155R60J474KE19D |
| 8 | 5 | C15,C16,C31,C32,C33 | CAP 18PF 50V CERAMIC 0402 SMD | Panasonic - ECG | ECJ-0EC1H180J |
| 9 | 1 | C17 | CAP CER 1PF 50V S 0402 UHI Q | Johanson | 500R07S1R0BV4T |
| 10 | 1 | C23 | CAP CER 10PF 5% 50V S 0402 | Panasonic - ECG | ECJ-0EC1H100D |
| 11 | 5 | C40,C41,C45,C46,C47 | CAP .10UF 16V CERAMIC X7R 0603 | Kemet | C0603C104J4RACTU |
| 12 | 1 | C44 | CAP CER 2.2UF 10V 10% X7R 0805 | Murata Electronics North America | GRM21BR71A225KA01L |
| 13 | 1 | C48 | CAP CERAMIC 1.0UF 10V X5R 0603 | Kemet | C0603C105K8PACTU |
| 14 | 1 | C49 | CAP 560PF 50V CERAMIC NPO 0603 | Panasonic - ECG | ECJ-1VC1H561J |
| 15 | 1 | C50 | CAP CER 10UF 16V X5R 0805 | Murata Electronics North America | GRM21BR61C106KE15L |
| 16 | 1 | D1 | LED BLUE CLEAR 0603 SMT | ROHM | SML512BC4T |
| 17 | 1 | D2 | LED GREEN CLEAR 0603 SMD | Lite-On Trading USA, Inc. | LTST-C190GKT |
| 18 | 1 | D3 | LED RED CLEAR 0603 SMD | Lite-On Trading USA, Inc. | LTST-C190CKT |
| 19 | 1 | FLT1 | MULTILAYER BANDPASS FILTER | TDK | DEA202450BT-1213C1 |
| 20 | 1 | F1 | THERMISTOR PTC 6V .35A RESETTABL | Littelfuse Inc | 1206L035YR |
| 21 | 1 | J3 | CONN PLUG USB 4POS RT ANG SMD | Molex/Waldom Electronics Corp | 48037-1000 |
| 22 | 1 | L1 | INDUCTOR 47NH +-5% FIXED 0603 | Panasonic - ECG | ELJ-RE47NJFA |
| 23 | 2 | L4,L2 | INDUCTOR 2.2NH +-.3NH FIXED 0402 | Panasonic - ECG | ELJ-RF2N2DFB |
| 24 | 1 | L3 | INDUCTOR 12NH 5% FIXED 402 SMD | Panasonic - ECG | ELJ-RF12NJF |
| 25 | 1 | L5 | INDUCTOR 5.6NH +-.3NH 0402 SMD | Panasonic - ECG | ELJ-RF5N6DFB |
| 26 | 1 | P1 | PC Board Connector, Dual Row, Right Angle 16 Circuits | Molex/Waldom Electronics Corp | 90152-2116 |
| 27 | 2 | R4,R5 | RES 160 OHM 1/16W 1% 0402 SMD | Yageo | RC0402FR-07160RL |
| 28 | 6 | R19,R20,R21,R38,R39,R40 | RES 2.2K OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ222V |
| 29 | 2 | R22,R33 | RES CHIP 100K OHM 1/10W 1% 0603 SMD | Yageo | RC0603FR-07100KL |
| 30 | 2 | R23,R24 | RES 2.2K OHM 1/16W 5% 0402 SMD | Panasonic - ECG | ERJ-2GEJ222X |
| 31 | 2 | R26,R25 | RES ZERO OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEY0R00V |
| 32 | 2 | R30,R31 | RES 100 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ101V |
| 33 | 2 | R37,R27 | RES 560 OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ561V |
| 34 | 1 | R36 | RES 330 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ331V |
| 35 | 2 | R29,R28 | RES 22 OHM 1/16W 1500PPM 5% 0603 | Panasonic - ECG | ERA-V15J220V |
| 36 | 1 | R34 | RES 10K OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ103V |
| 37 | 2 | R42,R41 | RES ZERO OHM 1/16W 0402 SMD | Panasonic - ECG | ERJ-2GE0R00X |
| 38 | 1 | SW1 | SWITCH TACT 6MM 150GF SPST SMD | Omron Electronic Components | B3FS-1052 |
| 39 | 1 | U1 | IC, 2.4 GHz CyFi Transceiver SoC QFN-40 | Cypress Semiconductor | CYRF7936-40LFXC |
| 40 | 1 | U3 | GaAs POWER AMPLIFIER | NEC Electronics Corporation | µPG2250T5N-E2-A |
| 41 | 2 | U5,U6 | GaAs IC SWITCH SPDT 6-MINIMOLD | NEC Electronics Corporation | UPG2214TK-E2-A |

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| 42 | 2 | U8,U7 | PSoC Mixed-Signal Array | Cypress Semiconductor | CY8C24894-24LFXI |
| 43 | 1 | U9 | IC REGULATOR LDO 3.3V 500MA SO8 | Linear Technology | LT1763CS8-3.3#PBF |
| 44 | 2 | U10,U11 | IC BUFFER ULP-A SGL SC70-5 | Fairchild | NC7SV34P5X |
| 45 | 1 | Y1 | Crystal 12 Mhz 10pf 6035 SMD | eCERA | FX1200065 |
| 46 | 1 | LABEL1 | Serial Number | | |
| 47 | 1 | LABEL2 | PCA LABEL | | 121R-43900 Rev** |
| NO LOAD Components | | | | | |
| 48 | 1 | R9 | RES NO LOAD 0402 SMD | NA | NA |
| 49 | 1 | R32 | RES CHIP 100K OHM 1/10W 1% 0603 SMD | Yageo | RC0603FR-07100KL |
| 50 | 1 | C43 | CAP 0.01UF 50V CERAMIC X7R 0603 | Panasonic | ECJ-1VB1H103K |
| 51 | 1 | J1 | CONN HEADER VERT 5POS .100 TIN | Molex/Waldom Electronics | 22-28-4050 |
| 52 | 13 | TV1,TV2,TV3,TV4,TV5,TV6 ,TV7,TV8,TV9,TV10,TV11, TV12,TV13 | TEST VIA 40 HOLE 20 PLATED | NONE | |

Table A-2. RF Expansion Card BOM

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| | | | PCB | Cypress | PDCR-9400 |
| 1 | 1 | ANT1 | ANTENNA CHIP 2.4GHZ SMD LEFT FD | Antenova | 3030A5839-01 |
| 2 | 4 | C1,C22,C25,C30 | CAP 27PF 50V CERAMIC NPO 0402 | Kemet | C0402C270J5GACTU |
| 3 | 4 | C2,C18,C38,C41 | CAP .10UF 10V CERAMIC X5R 0402 | Kemet | C0402C104K8PACTU |
| 4 | 1 | C4 | CAP CER 1.2PF 50V S 0402 UHI Q | Johanson | 500R07S1R2BV |
| 5 | 8 | C6,C26,C27,C28,C29,C34, C35,C36 | CAP 0.1 uF 10% 10V CERAMIC X5R 0402 | Panasonic - ECG | ECJ-0EB1A104K |
| 6 | 1 | C8 | CAP CER 10UF 6.3V X5R 0603 | Murata | GRM188R60J106ME47D |
| 7 | 1 | C9 | CAP 1 uF 6.3V CERAMIC X5R 0402 | Panasonic | ECJ-0EB0J105M |
| 8 | 6 | C10,C11,C13,C14,C19,C20 | CAP CERM .047UF 10% 16V X5R 0402 | AVX | 0402YD473KAT2A |
| 9 | 2 | C12,C39 | CAP CER .47UF 6.3V X5R 0402 | Murata | GRM155R60J474KE19D |
| 10 | 5 | C15,C16,C31,C32,C33 | CAP 18PF 50V CERAMIC 0402 SMD | Panasonic - ECG | ECJ-0EC1H180J |
| 11 | 1 | C23 | CAP CER 10PF 5% 50V S 0402 | Panasonic - ECG | ECJ-0EC1H100D |
| 12 | 1 | C40 | CAP 100PF 50V CERAMIC 0402 SMD | Panasonic - ECG | ECJ-0EC1H101J |
| 13 | 3 | C44,C45,C46 | CAP CER 10UF 16V X5R 0805 | Murata Electronics North America | GRM21BR61C106KE15L |
| 14 | 1 | D1 | LED RED CLEAR 0603 SMD | Lite-On Trading USA, Inc. | LTST-C190CKT |
| 15 | 1 | D2 | LED GREEN CLEAR 0603 SMD | Lite-On Trading USA, Inc. | LTST-C190GKT |
| 16 | 1 | FLT1 | MULTILAYER BANDPASS FILTER | TDK | DEA202450BT-1213C1 |
| 17 | 1 | J1 | CONN HEADER 16POS .100" R/A TIN | Molex/Waldom Electronics Corp | 90122-0128 |
| 18 | 1 | L1 | INDUCTOR 47NH +-5% FIXED 0603 | Panasonic - ECG | ELJ-RE47NJFA |
| 19 | 2 | L4,L2 | INDUCTOR 2.2NH +-.3NH FIXED 0402 | Panasonic - ECG | ELJ-RF2N2DFB |
| 20 | 1 | L3 | INDUCTOR 12NH 5% FIXED 402 SMD | Panasonic - ECG | ELJ-RF12NJF |
| 21 | 1 | L5 | INDUCTOR 5.6NH +-.3NH 0402 SMD | Panasonic - ECG | ELJ-RF5N6DFB |
| 22 | 1 | L6 | COIL PWR CHOKE 10UH 700MA SMD | Murata | LQH32PN100MN0 |
| 23 | 1 | P1 | PC Board Connector, Dual Row, Right Angle 16 Circuits | Molex/Waldom Electronics Corp | 90152-2116 |
| 24 | 1 | RT1 | THERMISTOR NTC 10K OHM LEADED | BC Components | 2381 640 55103 |
| 25 | 1 | R2 | RES ZERO OHM 1/16W 0402 SMD | Panasonic - ECG | ERJ-2GE0R00X |
| 26 | 1 | R3 | RES 1.00 OHM 1/16W 1% 0402 SMD | Vishay/Dale | CRCW04021R00FNED |
| 27 | 1 | R4 | RES 140 OHM 1/16W 1% 0402 SMD | Yageo | RC0402FR-07140RL |

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| 28 | 1 | R5 | RES 160 OHM 1/16W 1% 0402 SMD | Yageo | RC0402FR-07160RL |
| 29 | 1 | R6 | RES 47 OHM 1/16W 5% 0402 SMD | Panasonic - ECG | ERJ-2GEJ470X |
| 30 | 3 | R15,R16,R17 | RES CHIP 1.0K OHM 1/16W 5% 0402 SMD | Yageo | RC0402JR-071KL |
| 31 | 1 | R18 | RES CHIP 10.0K OHM 1/16W .1% 0603 SMD | Panasonic - ECG | ERA-3AEB103V |
| 32 | 1 | R21 | RES 390 OHM 1/16W 1% 0603 SMD | Panasonic - ECG | ERJ-3EKF3900V |
| 33 | 1 | R26 | RES 560 OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ561V |
| 34 | 2 | R27,R28 | RES 2.2K OHM 1/16W 5% 0402 SMD | Panasonic - ECG | ERJ-2GEJ222X |
| 35 | 1 | R29 | RES 330 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ331V |
| 36 | 2 | R32,R30 | RES CHIP 100K OHM 1/16W 1% 0402 SMD | Vishay | CRCW0402100KFKED |
| 37 | 2 | R31,R35 | RES 237K OHM 1/16W 1% 0402 SMD | Vishay | CRCW0402237KFKED |
| 38 | 1 | R33 | RES CHIP 10K OHM 1/16W 5% 0402 SMD | Yageo | RC0402JR-0710KL |
| 39 | 2 | SW1,SW2 | SWITCH LT 4.7MMX3.5MM 250GF SMD | Panasonic - ECG | EVQ-P2H02B |
| 40 | 1 | U1 | IC, LP 2.4 GHz RADIO SoC QFN-40 | Cypress Semiconductor | CYRF6936-40LFXC |
| 41 | 1 | U2 | IC STEP-UP DC/DC CONVERTER SC70-6 | Linear Technology | LTC3525ESC6-3.3#TRPBF |
| 42 | 1 | U3 | GaAs POWER AMPLIFIER | NEC Electronics Corporation | µPG2250T5N-E2-A |
| 43 | 1 | U4 | IC PROGRAMMABLE SOC SSOP28 | Cypress Semiconductor | CY8C27443-24PVXI |
| 44 | 2 | U5,U6 | GaAs IC SWITCH SPDT 6-MINIMOLD | NEC Electronics Corporation | UPG2214TK-E2-A |
| 45 | 2 | U7,U8 | IC BUFFER ULP-A SGL SC70-5 | Fairchild | NC7SV34P5X |
| 46 | 1 | Y1 | Crystal 12 Mhz 10pf 6035 SMD | eCERA | FX1200065 |
| 47 | 1 | LABEL1 | Serial Number | | |
| 48 | 1 | LABEL2 | PCA LABEL | | 121R-40000 Rev 4 |
| NO LOAD Components | | | | | |
| 49 | 7 | R1,R8,R19,R22,R23,R24,R25 | RES NO LOAD 0402 SMD | NA | NA |
| 50 | 1 | R7 | RES ZERO OHM 1/16W 0402 SMD | Panasonic - ECG | ERJ-2GE0R00X |
| 51 | 1 | R20 | RES 390 OHM 1/16W 1% 0603 SMD | Panasonic - ECG | ERJ-3EKF3900V |
| 52 | 1 | R34 | RES 10 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ100V |
| 53 | 3 | C3,C17,C24 | CAP 2.0 PF 50V CERAMIC NPO 0402 | Kemet | C0402C209C5GACTU |
| 54 | 1 | C37 | CAP .10UF 10V CERAMIC X5R 0402 | Kemet | C0402C104K8PACTU |
| 55 | 1 | C42 | CAP 0.01UF 50V CERAMIC X7R 0603 | Panasonic | ECJ-1VB1H103K |
| 56 | 1 | C43 | CAP CER 10UF 16V X5R 0805 | Murata Electronics North America | GRM21BR61C106KE15L |
| 57 | 10 | TV1,TV2,TV3,TV4,TV5,TV6,TV7,TV8,TV9,TV10 | TEST VIA 40 HOLE 20 PLATED | NONE | |

Table A-3. Multifunction Expansion BOM

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| 1 | 1 | C1 | CAP 10000PF 16V CERM X7R 0603 | Panasonic | ECJ-1VB1C103K |
| 2 | 2 | C2,C3 | CAP .10UF 10V CERAMIC X5R 040 | Kemet | C0402C104K8PACTU |
| 3 | 1 | C4 | CAP 4.7UF 16V Tantalum 3216 | Nichicon | F931C475MAA |
| 4 | 1 | D1 | LED 3.2X3.6MM R/G/B WTR CLR SMD | Kingbright Corp | APF3236SURKVGAPBA |
| 5 | 1 | D4 | DIODE ZENER 2.4V 150MW S-MINI 2P | Panasonic - SSG | MAZ802400L |
| 6 | 1 | J1 | CONN HEADER 16POS .100" R/A TIN | Molex/Waldom Electronics Corp | 90122-0128 |
| 7 | 1 | LS1 | BUZZER MAGNETIC 8.5MM 3-5V SMD | CUI Inc | CSS-J4D20 |
| 8 | 1 | PRX1 | Low Profile Single Pin Socket Thru Hole | Samtec | CES-101-01-T-S |
| 9 | 1 | PR1 | IC AMBIENT LIGHT DETECTOR 1206 | Microsemi-IPG | LX1972IBC-TR |
| 10 | 1 | Q1 | MOSFET N-CH 60V 115MA SOT-23 | Diodes Inc | 2N7002-7-F |
| 11 | 1 | RT1 | THERMISTOR NTC 10K OHM 1% LEADED | BC Components | 2381 640 55103 |
| 12 | 1 | R1 | RES CHIP 10.0K OHM 1/16W .1% 0603 SMD | Panasonic - ECG | ERA-3AEB103V |
| 13 | 1 | R11 | RES CHIP 10.0K OHM 1/16W 1% 0603 SMD | Phycomp USA Inc | 9C06031A1002FKHFT |
| 14 | 1 | R2 | RES 680 OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ681V |
| 15 | 1 | R3 | RES 1.6K OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ162V |
| 16 | 2 | R4,R5 | RES 2.0K OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ202V |
| 17 | 1 | R6 | RES 1.0K OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ102V |
| 18 | 1 | R8 | RES 100 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ101V |
| 19 | 2 | R10,R9 | RES 2.2K OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ222V |
| 20 | 1 | R19 | RES 4.99K OHM 1/16W 1% 0603 SMD | Panasonic - ECG | ERJ-3EKF4991V |
| 21 | 9 | R7,R12,R13,R14,R15, R16,R17,R18,R20 | RES 560 OHM 1/10W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ561V |
| 22 | 1 | U3 | IC PROGRAMMABLE SOC MLF32 | Cypress Semiconductor | CY8C21434-24LFXI |
| 23 | 1 | PCB | PRINTED CIRCUIT BOARD | Cypress Semiconductor | PDCR-9402 Rev ** |
| 24 | 1 | LABEL1 | Serial Number | | |
| 25 | 1 | LABEL2 | PCA LABEL | | 121R-40201 Rev** |
| DO NOT INSTALL | | | | | |
| 26 | 7 | CSB1-CSB7 | CapSense Touch Element FTMF | NA | NA |
| 27 | 8 | TV1,TV2,TV3,TV4,TV5,TV6 ,TV7,TV8 | TEST VIA 40 HOLE 20 PLATED | NONE | |

Table A-4. AAA Power Pack BOM

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| | | | PCB | Cypress | PDCR-9456 |
| 1 | 1 | BH1 | BATTERY HOLDER 2AAA CELL PC MT | Keystone Electronics | 2468 |
| 2 | 1 | C1 | CAP ELECT 1500UF 6.3V FK SMD | Panasonic | EEE-FK0J152P |
| 3 | 3 | C3,C4,C5 | CAP CER 10UF 16V X5R 0805 | Murata Electronics North America | GRM21BR61C106KE15L |
| 4 | 1 | J1 | CONN HEADR BRKWAY .100 03POS STR | Tyco Electronics/Amp | 5-146280-3 |
| 5 | 1 | L1 | COIL PWR CHOKE 10UH 700MA SMD | Murata | LQH32PN100MN0 |
| 6 | 1 | P1 | PC Board Connector, Dual Row, Right Angle 16 Circuits | Molex/Waldom Electronics Corp | 90152-2116 |
| 7 | 1 | R1 | RES 100K OHM 1/16W 5% 0402 SMD | Panasonic - ECG | ERJ-2GEJ104X |
| 8 | 1 | SW1 | SWITCH SLIDE SPDT .3A RT ANGLE | E-Switch | EG1270 |
| 9 | 1 | U1 | IC STEP-UP DC/DC CONVERTER SC70-6 | Linear Technology | LTC3525ESC6-3.3#TRPBF |
| 10 | 1 | N/A | SHUNT/JUMPER 2POS .100 BLACK | Superior Tech Co | MJPB-D02BG1CA-A |
| 11 | 1 | LABEL1 | Serial Number | | |
| 12 | 1 | LABEL2 | PCA LABEL | | 121R-45600 Rev** |
| NO LOAD Components | | | | | |
| 13 | 1 | C2 | CAP CER 10UF 16V X5R 0805 | Murata Electronics North America | GRM21BR61C106KE15L |
| 14 | 1 | C6 | CAP 0.01UF 50V CERAMIC X7R 0603 | Panasonic | ECJ-1VB1H103K |
| 15 | 1 | R2 | RES 10 OHM 1/16W 5% 0603 SMD | Panasonic - ECG | ERJ-3GEYJ100V |
| 16 | 5 | TV1,TV2,TV3,TV4,TV5 | TEST VIA 40 HOLE 20 PLATED | NONE | |

Table A-5. CR2302 Power Pack BOM

| Item | Qty | Reference | Description | Manufacturer | Mfr Part Number |
|---|---|---|---|---|---|
| | | | PCB | Cypress | PDCR-9457 |
| 1 | 1 | BH1 | BATTERY CLIP COIN CELL 20mm | KEYSTONE | 3002 |
| 2 | 1 | C1 | CAP ELECT 1500UF 6.3V FK SMD | Panasonic | EEE-FK0J152P |
| 3 | 1 | P1 | PC Board Connector, Dual Row, Right Angle 16 Circuits | Molex/Waldom Electronics Corp | 90152-2116 |
| 4 | 1 | R1 | RES 47 OHM 1/10W 1% 0805 SMD | Yageo America | RC0805FR-0747RL |
| 5 | 1 | SW1 | SW SLIDE DPDT 6VDC 0.3A PCMNT | C&K Components | JS202011AQN |
| 6 | 1 | LABEL1 | Serial Number | | |
| 7 | 1 | LABEL2 | PCA LABEL | | 121R-45700 Rev*A |
| NO LOAD Components | | | | | |
| 8 | 3 | TV1,TV2,TV3 | TEST VIA 40 HOLE 20 PLATED | NONE | |