# CY8CKIT-148-COIL

# Inductive Sensing Coil Breakout Board Kit Guide

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# Safety Information

## Regulatory Compliance

The CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board is intended for use as a evaluation platform for hardware or software in a laboratory environment. The board is an open system design, which does not include a shielded enclosure. This may cause interference to other electrical or electronic devices in close proximity. In a domestic environment, this product may cause radio interference. In such cases, you may be required to take adequate preventive measures. In addition, this board should not be used near any medical equipment or RF devices.

Attaching additional wiring to this product or modifying the product operation from the factory default settings may affect its performance and cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

The CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board, as shipped from the factory, has been verified to meet with requirements of CE as a Class A product.

End-of-Life/Product Recycling

This kit has an end-of life five years from the date of manufacture mentioned on the back of the box. Contact your nearest recycler for discarding the kit.

# 1. Introduction

The CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board is designed as an easy-to-use and inexpensive evaluation platform. The Kit along with the CY8CKIT-148 PSoC® 4700S Inductive Sensing Evaluation Kit (EVK) delivers a low cost and complete system solution for embedded applications of Inductive sensing.

While the CY8CKIT-148 EVK can be used stand-alone, this kit offers additional sensor patterns for evaluating Inductive Sensing Technology with PSoC 4700S device.

Download the kit guide of the CY8CKIT-148 PSoC® 4700S Inductive Sensing Evaluation Kit from the webpage for more details on the base board that is used in conjunction with this kit.

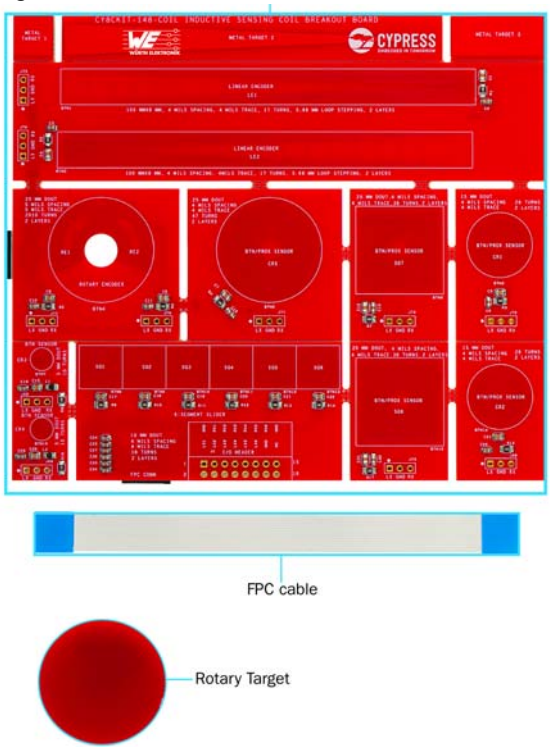
## 1.1 Kit Contents

CY8CKIT-148-COIL kit includes the following:

- Inductive Sensing Breakout Board
- Metal Target (Rotary Target)
- FPC cable

The Quick Start Guide is printed on the kit package.

Figure 1-1. CY8CKIT-148-COIL Kit Contents

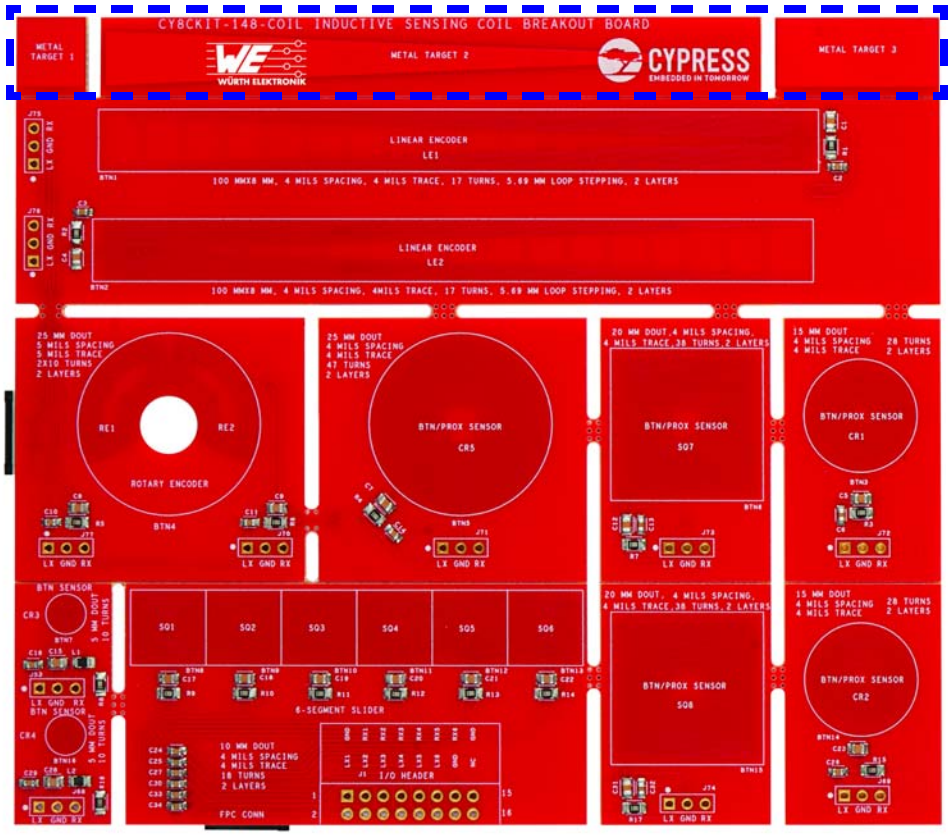


## 1.2 Getting started with the Kit

To start with the CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board, follow the steps below:

- Check the kit contents as described in Kit Contents on page 5.
- Download the hardware files from the kit webpage.
- The breakout board has three metal targets as shown in Figure 1-2.

Figure 1-2. Three metal targets on the CY8CKIT-148-COIL board



- Break METAL TARGET 1 and METAL TARGET 3 as shown in Figure 1-3.

Figure 1-3. METAL TARGET 1 and METAL TARGET 3 on the CY8CKIT-148-COIL board

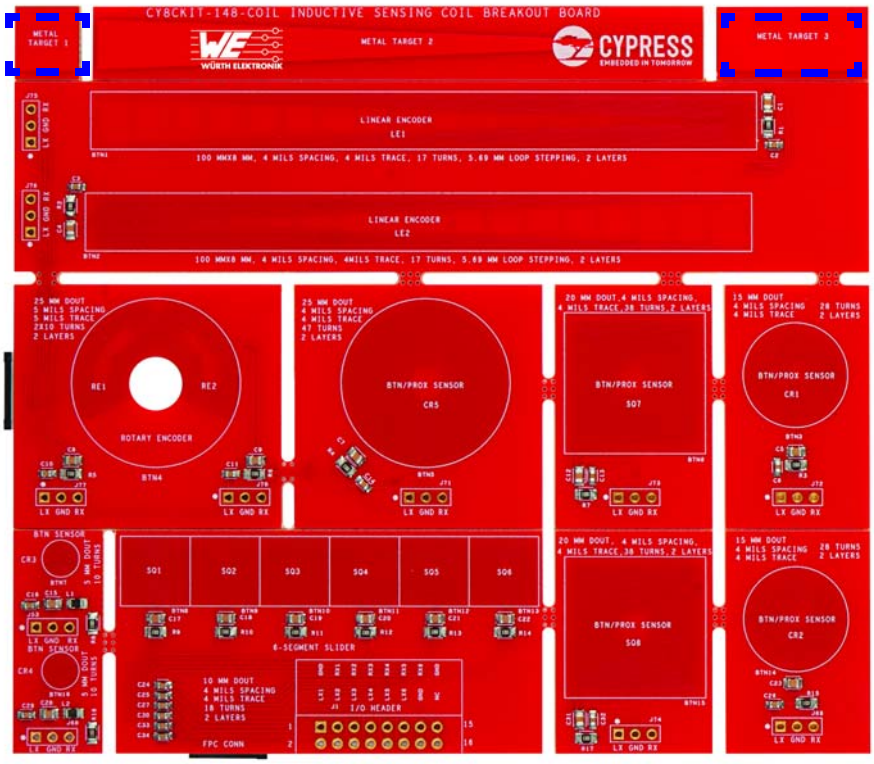
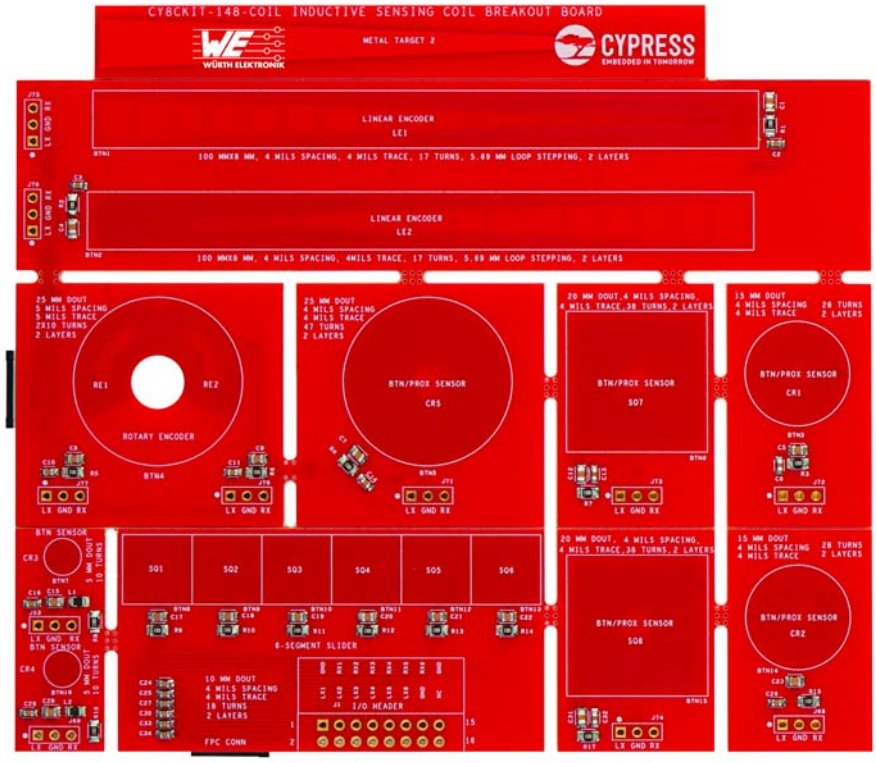



Figure 1-4. CY8CKIT-148-COIL board after removal of METAL TARGET 1 and METAL TARGET 3



- Place the breakout board flat on the edge of a stable surface with METAL TARGET 2 hanging over the edge. Holding the breakout board firmly, apply downward pressure to METAL TARGET 2 to break the target away.
  This is an optional step. User can leave METAL TARGET 2 attached if they are not going to use it for one of the sliders.

Figure 1-5. Procedure to break the METAL TARGET 2

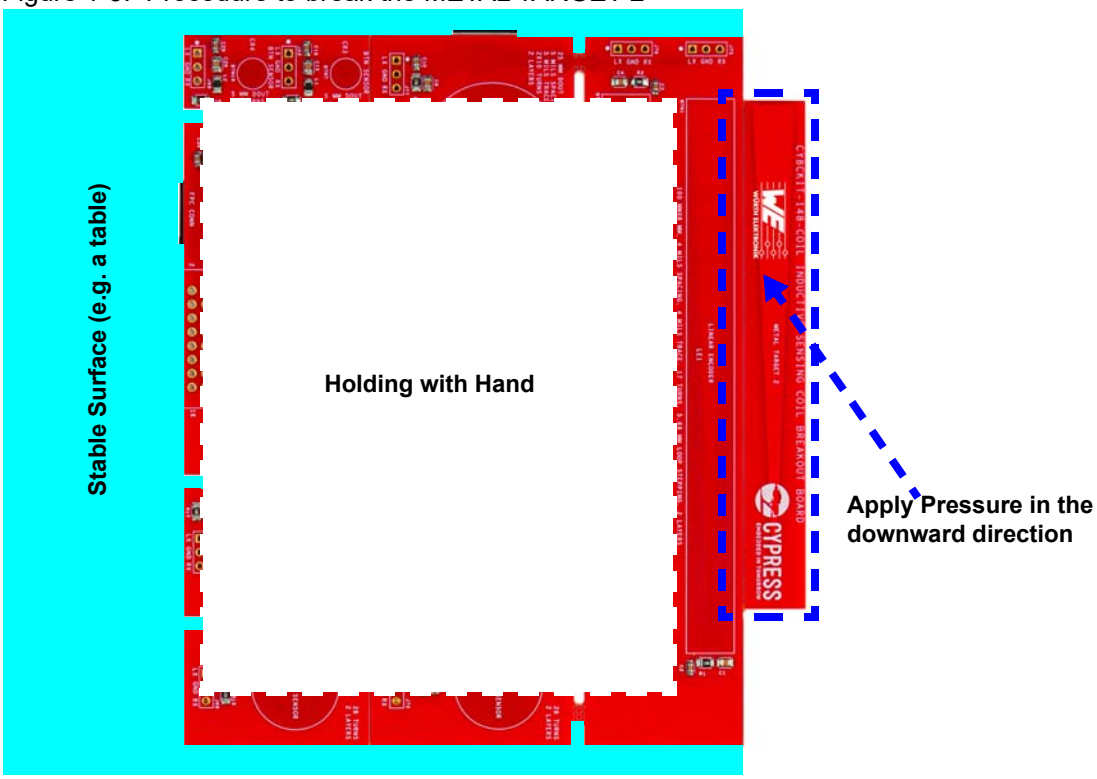
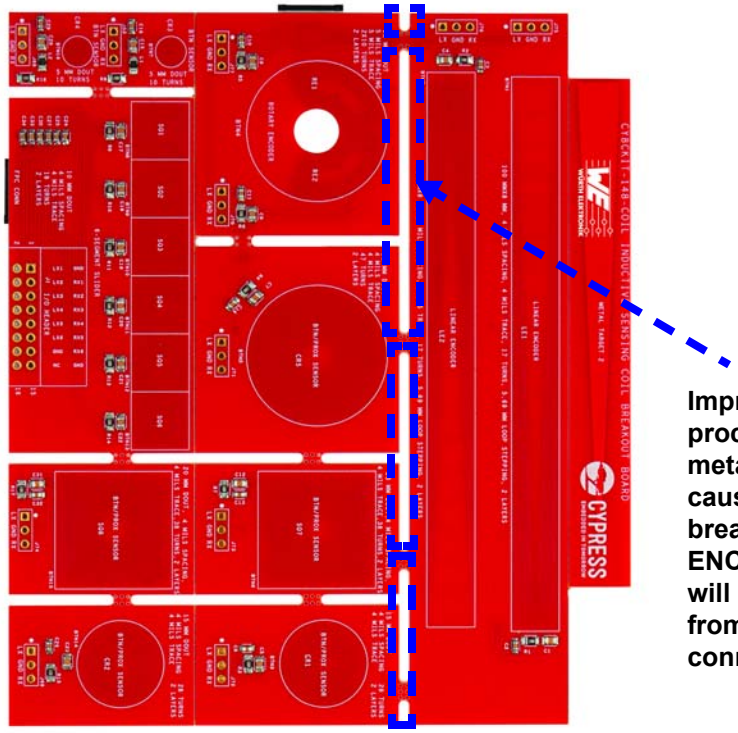


Figure 1-6. Breakout regions that may get affected because of improper breaking procedure




**METAL TARGET 2 can be difficult to break away from the breakout board. Carefully follow the procedure described above.**

- The following on-board sensors are not connected to any of the FPC connectors.
  - BTN/PROX SENSOR (SQ7, SQ8)
  - BTN/PROX SENSOR (CR1, CR2)
  - BTN SENSOR (CR3, CR4)

  If you want to evaluate any of these sensors, you need to connect wires between the corresponding I/O header on the breakout board and the coil expansion connector (J4) on the CY8CKIT-148 kit. In addition to that you need to change some components on the CY8CKIT-148 board. See Table A-2 on page 26 for connection details.
- There are two on-board FPC connectors. The remaining sensors below are connected to the FPC connectors and the headers both.
  - LINEAR ENCODER (LE1, LE2)
  - ROTARY ENCODER (RE1, RE2)
  - 6-SEGMENT SLIDER (SQ1 to SQ6)

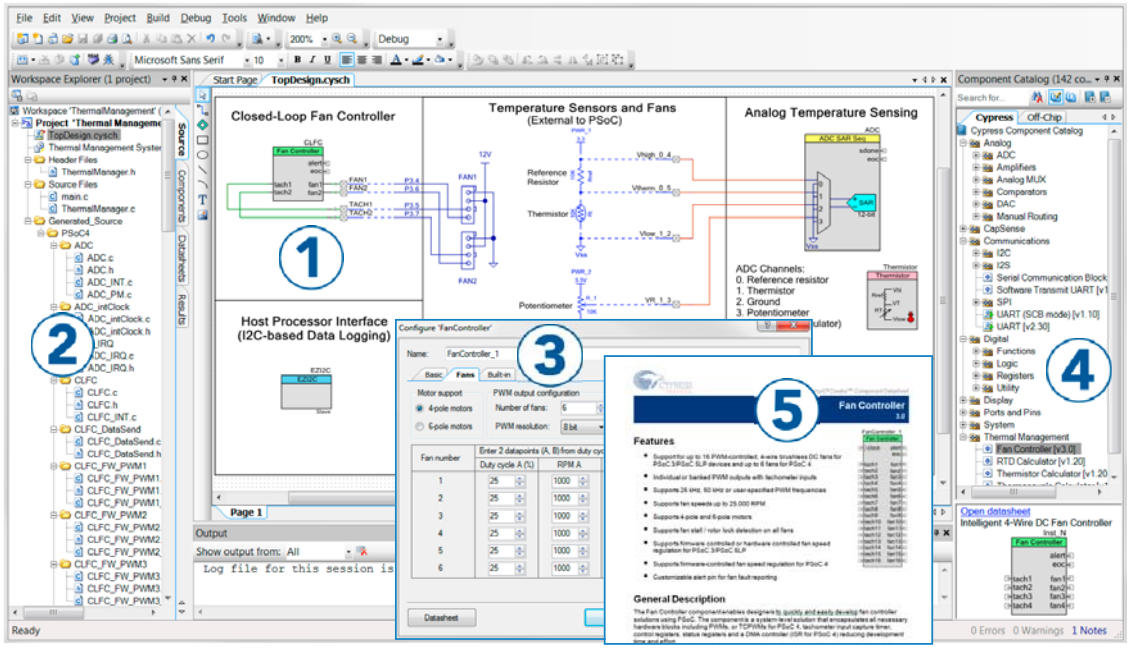
  These sensors are default connected to the FPC connector. If there is any requirement of connecting the sensors through the headers, you need to refer the same Table A-2 on page 26.
- See the Kit Operation chapter on page 18 that describes the principle of inductive sense technology. This chapter describes all the inductive sensor patterns present on this board.
- See the Appendix chapter on page 24 to get header and connector details of the board, Kit Schematics, and the bill of materials (BOM).

## 1.3 PSoC Creator

PSoC Creator™ is a state-of-the-art, easy-to-use integrated design environment (IDE). It introduces revolutionary hardware and software co-design, powered by a library of pre-verified and pre-characterized PSoC Components. With PSoC Creator, you can:

1. Drag and drop Components to build your hardware system design in the main design workspace.
2. Co-design your application firmware with the PSoC hardware.
3. Configure Components using configuration tools.
4. Explore the library of 100+ Components.
5. Review Component datasheets.

Figure 1-7. PSoC Creator Features




PSoC Creator also enables you to tap into an entire tool ecosystem with integrated compiler chains and programmers for PSoC devices.

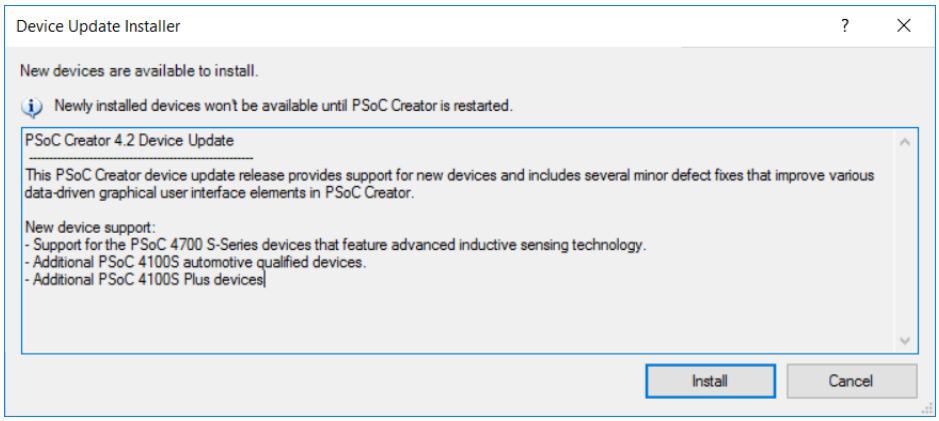
For more information, visit www.cypress.com/psoccreator. Visit the PSoC Creator Video Training Page for video tutorials on learning and using PSoC Creator.

### 1.3.1 Installing PSoC 4700S Device in PSoC Creator

The steps below need to be followed in order to install PSoC 4700S device into PSoC Creator before opening the code example workspace for the first time. These steps only need to be done once.

1. Run PSoC Creator 4.2.
2. Go to **Tools > Find new devices** in PSoC Creator. The Device Update Installer window will pop-up.

Figure 1-8. Device Update Installer

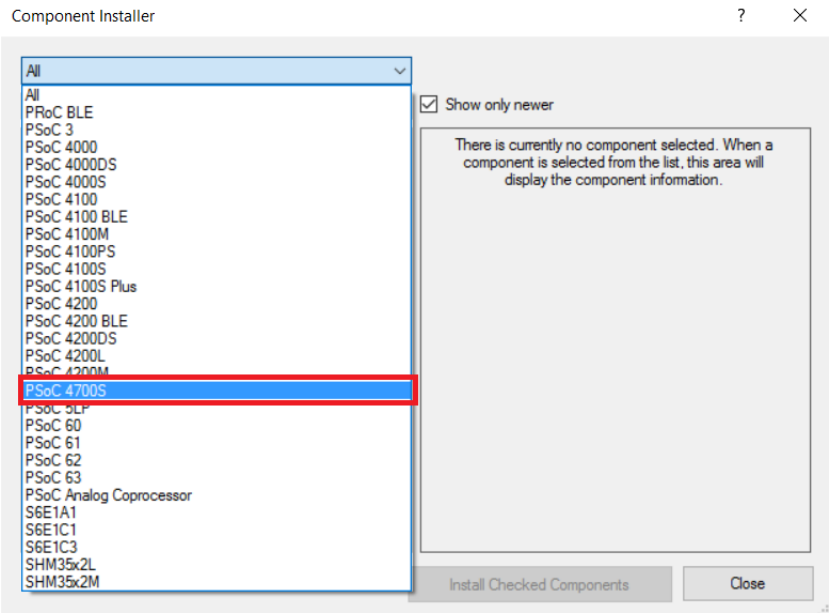



3. Click on the **Install** Button.
4. **Restart PSoC Creator**. Note that this is an important step. The devices will only be available after PSoC Creator is restarted.

   The devices should now be available in the device selector when you create a new project.

   From the dropdown list, select **PSoC 4700S**.

Figure 1-9. Device Selection

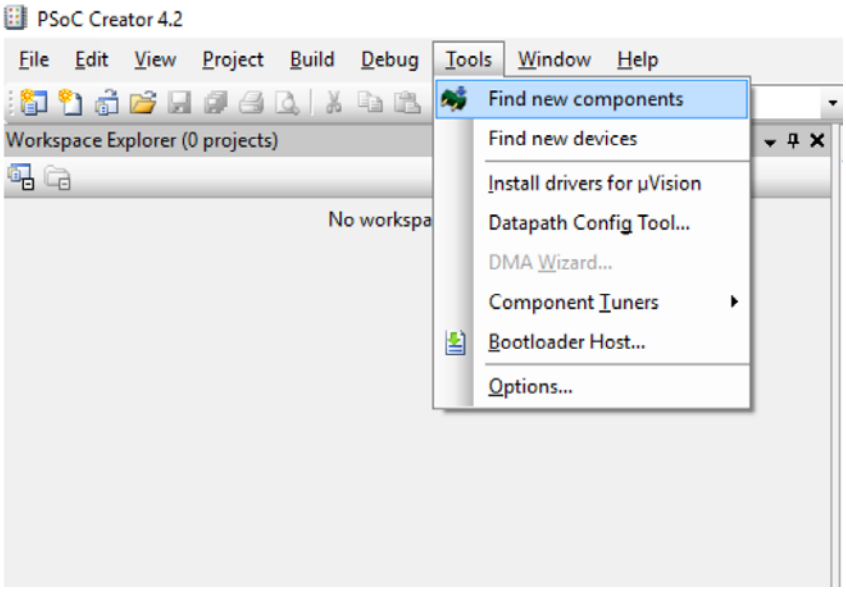


### 1.3.2 Installing the MagSense Component

The steps below need to be followed to install the latest version of the MagSense component before opening the code example workspace for the first time. These steps only need to be done once.

1. To install the MagSense Component, Click **Tools** > **Find new components**. Figure 1-10 shows this step.

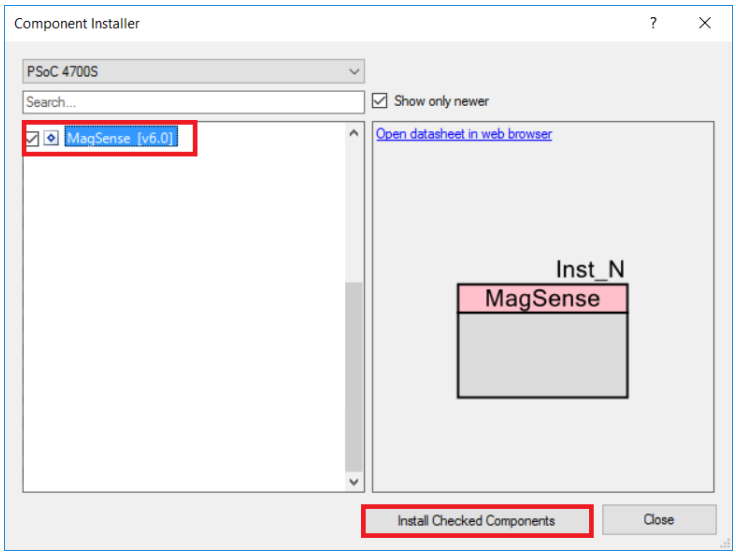
Figure 1-10. Tools Tab for finding New Components




2. Select the MagSense Component and click **Install Checked Components**. This will install the MagSense Component in your software.

   **Note:** You can skip this step if the MagSense Component is pre-installed in PSoC Creator.

Figure 1-11. Component Installation



### 1.3.3 PSoC Creator Code Examples

PSoC Creator includes a large number of code examples. These examples are available from the PSoC Creator Start Page, as shown in Figure 1-12 or from the menu **File** > **Code Example**....

Code examples can speed up your design process by starting you off with a complete design, instead of a blank page. The code examples also show how PSoC Creator Components can be used for various applications. Code examples and documentation are included, as shown in Figure 1-13 on page 13.

From the **Find Code Example** dialog shown in Figure 1-13 on page 13, you can:

- Filter for examples based on architecture or device family, that is, PSoC 3, PSoC 4, or PSoC 5LP, project name, or keyword.
- Select from the list of examples offered based on the **Filter Options**.
- Review the code example's description (on the **Documentation** tab).
- Review the code from the **Sample Code** tab. You can copy the code from this window and paste to your project, which can help speed up code development.
- Create a new project (and a new workspace if needed) based on the selection. This can speed up your design process by starting you off with a complete, basic design. You can then adapt that design to your application.

Figure 1-12. Code Examples in PSoC Creator

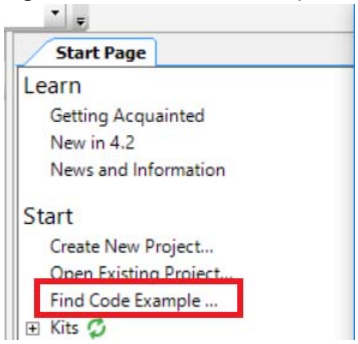
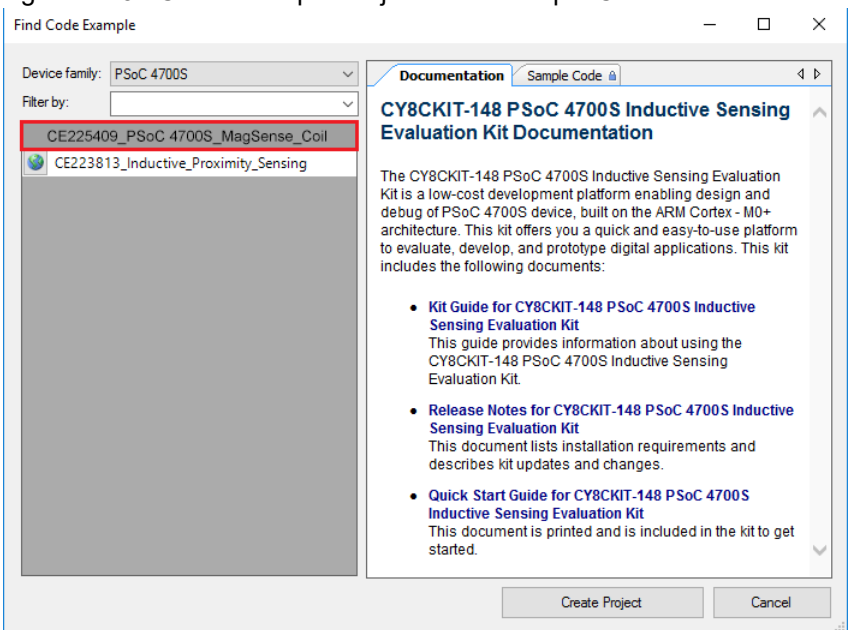



Figure 1-13. Code Example Projects with Sample Code



### 1.3.4 Kit Code Examples

You can access the installed kit code examples from the PSoC Creator Start Page. To access these examples, expand **Kits** under **Start**; then, expand CY8CKIT-148 to see the code examples. You can download CE225409-PSoC 4700S MagSense COIL for example projects that can be used with the CY8CKIT-148 and CY8CKIT-148-COIL to implement custom applications.

### 1.3.5 PSoC Creator Help

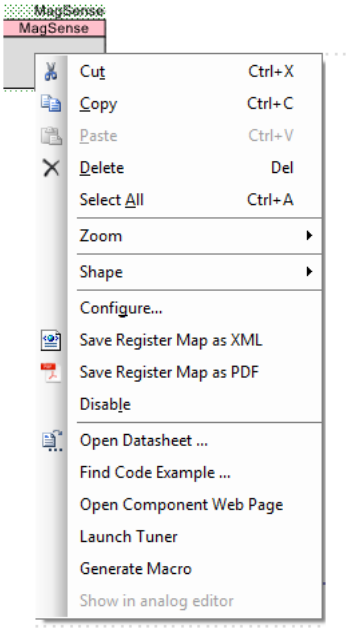
Launch PSoC Creator and navigate to the following items:

- **Quick Start Guide**: Choose **Help** > **Documentation** > **Quick Start Guide**. This guide gives you the basics for developing PSoC Creator projects.
- **Simple Component Code Examples**: Choose **File** > **Code Example**. These examples demonstrate how to configure and use PSoC Creator Components. To access examples related to a specific Component, right-click the Component in the schematic or in the Component Catalog. Select **Find Code Example** in the context menu that appears.
- **System Reference Guide**: Choose **Help** > **System Reference Guides**. This guide lists and describes the system functions provided by PSoC Creator.

### 1.3.6 Component Datasheets

Right-click a Component and select **Open Datasheet** (see Figure 1-14).

Figure 1-14. Opening Component Datasheet



## 1.4 Additional Learning Resources

Cypress provides a wealth of data at www.cypress.com to help you select the right PSoC device for your design, and to help you quickly and effectively integrate the device into your design. For a comprehensive list of resources, see KBA86521, How to Design with PSoC 3, PSoC 4, and PSoC 5LP. The following is an abbreviated list for PSoC 4:

- Overview: PSoC Portfolio and PSoC Roadmap.
- Product Selectors: PSoC 4 Product Selector. In addition, PSoC Creator includes a device selection tool.
- Datasheets: Describe and provide electrical specifications for the PSoC 4000, PSoC 4100, PSoC 4200, PSoC 4100M, PSoC 4200M, PSoC 4200L, PSoC 4100S Plus and PSoC 4700S devices.
- CapSense Design Guide: Learn how to design capacitive touch-sensing applications with the PSoC 4 and PSoC Analog Coprocessor family of devices.
- Inductive Sensing Design Guide: Learn how to design inductive sensing applications with the PSoC 4 family of devices.
- Application Notes and Code Examples: Cover a broad range of topics, from basic to advanced. Many of the application notes include code examples. Visit the PSoC 3/4/5 Code Examples webpage for a list of all available PSoC Creator code examples. To access code examples from within PSoC Creator, see PSoC Creator Code Examples on page 13.
- Technical Reference Manuals (TRM): Provide detailed descriptions of the architecture and registers in each PSoC 4 device family.
- Development Kits:
  - CY8CKIT-041, CY8CKIT-046, CY8CKIT-044, CY8CKIT-042, and CY8CKIT-040 are easy-to-use and inexpensive development platforms. These kits include connectors for Arduino™ compatible shields and Digilent Pmod Peripheral Modules.
  - CY8CKIT-043, CY8CKIT-049, CY8CKIT-145, CY8CKIT-146, and CY8CKIT-149 are very low-cost prototyping platforms for sampling PSoC 4 devices.
  - CY8CKIT-001 is a common development platform for all PSoC family devices.
  - The MiniProg3 and MiniProg4 devices provide interface for flash programming and debug.
- Knowledge Base Articles (KBAs): Provide design and application tips from experts on using the device.
- PSoC Creator Training: Visit www.cypress.com/go/creatorstart/creatortraining for a comprehensive list of video training on PSoC Creator.
- Learning from Peers: Visit community.cypress.com/welcome to meet enthusiastic PSoC developers discussing the next-generation embedded systems on Cypress Developer Community Forums.

## 1.5 Technical Support

For assistance, visit Cypress Support or contact customer support at +1 (800) 541-4736 Ext. 3 (in the USA) or +1 (408) 943-2600 Ext. 3 (International).

You can also use the following support resources if you need quick assistance:

- Self-help (Technical Documents)
- Local Sales Office Locations

## 1.6 Document 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 Creator 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. |

## 1.7 Acronyms

Table 1-2. Acronyms Used in this Document

| Acronym | Description |
|---|---|
| BOM | Bill of Materials |
| CE | Code Example |
| CR | Circular Coil |
| DAC | Digital to Analog Converter |
| ESD | Electrostatic Discharge |
| EVK | Evaluation Kit |
| GPIO | General Purpose Input/Output |
| I2C | Inter-Integrated Circuit |
| IDAC | Current DAC |
| IDE | Integrated Design Environment |
| KBA | Knowledge Based Article |
| LE | Linear Encoder |
| LED | Light-Emitting Diode |
| PSoC | Programmable Systems-on-Chip |
| RE | Rotary Encoder |
| SQ | Square Coil |
| SWD | Serial Wire Debug |
| UART | Universal Asynchronous Receiver Transmitter |
| USB | Universal Serial Bus |

# 2. Kit Operation

This chapter introduces you to different features of the Inductive Sensing Coil Breakout Board. This includes the parameters of each coil on the kit and the recommended configuration settings for use with the MagSense Component in PSoC Creator.

## 2.1 Theory of Operation

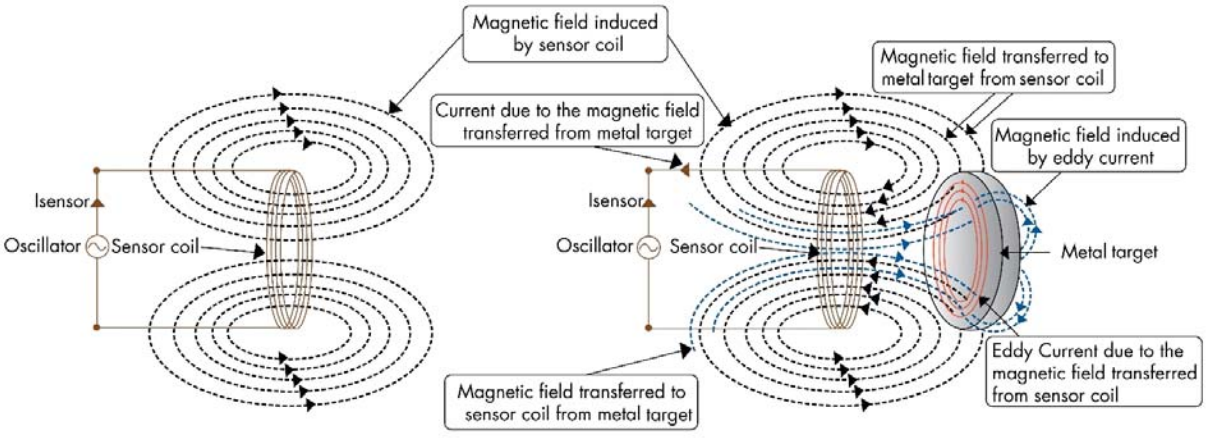
This section provides a high-level description of the principle of proximity sensing and describes where the CY8CKIT-148-COIL fits in an inductive sensing system.

### 2.1.1 Principle of Inductive Sensing

Inductive sensing works on the principle of electromagnetic coupling between a sensor coil and the metal target to be detected. When the metal target enters the electromagnetic field induced by a sensor coil, some of the electromagnetic energy is transferred into the metal target as shown in Figure 2-1. This transferred energy causes a circulating electrical current called an eddy current. The eddy current flowing in the metal target induces reverse electromagnetic field on the sensor coil, which results in a reduction of the effective inductance of the sensor coil.

The sensor coil is placed in parallel with a capacitor. The parallel combination of sensor inductance and the external capacitor is called a tank circuit. The reduction in the sensor coil inductance causes an upward shift in the resonant frequency of the tank circuit. This shift in resonant frequency changes the amplitude of the signal across the sensor coil. The change in the amplitude of the sensor coil signal is measured by the PSoC 4700S MCU to detect the presence of the metal target in the proximity-sensing distance. Note that the inductance of the sensor coil increases in the presence of ferromagnetic metal targets. An increase in the sensor coil inductance causes a down shift in the resonant frequency of the tank circuit.

Figure 2-1. Field Coupling between Sensor Coil and Metal Target Inductive Sensing Design Guide



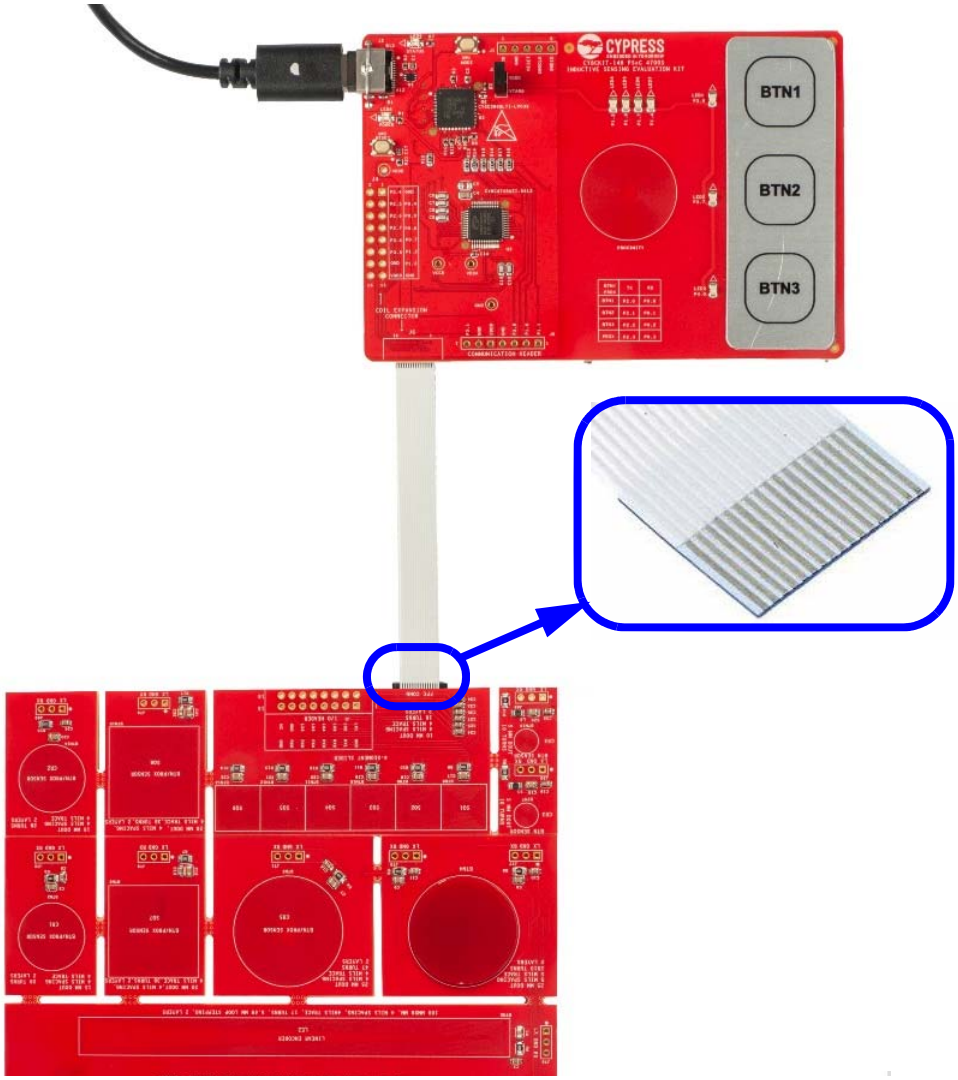
Typical applications for inductive sensing include the following:

- Proximity detection
- Mechanical open/close switches
- Buttons (industrial keypads and ON/OFF buttons)
- Rotation detection (flow meters, fan speed RPM detection, rotary control knob)
- Linear Encoders
- Spring compression detection

### 2.1.2 CY8CKIT-148-COIL System

The CY8CKIT-148 provides three buttons and one proximity sensor. By adding the CY8CKIT-148-COIL, additional coils which may be used as reference designs for custom inductive sensing systems are added. These sensors can be interfaced with PSoC 4700S device present on the CY8CKIT-148 PSoC 4700S Inductive Sensing Evaluation Kit.

Figure 2-2. Connection between the CY8CKIT-148-COIL kit and the CY8CKIT-148 base board using the provided FPC connector



The MagSense circuitry in the PSoC 4700S device on the CY8CKIT-148 EVK senses the changes in the inductance of the coils on the CY8CKIT-148-COIL. Based on the data the PSoC 4700S device receives, the PSoC MCU determines the presence of a conductive target object.

The PSoC device on the CY8CKIT-148 EVK may be programmed through the on-board KitProg hardware, which communicates to the software programming tool (PSoC Programmer) through the USB interface on the board. You can develop firmware applications for the PSoC 4700S to handle the inductive sensing data using PSoC Creator IDE.

CE225409 - PSoC 4700S MagSense COIL provides example projects that can be used with the CY8CKIT-148-COIL to implement custom applications.

## 2.2 Functional Description

### 2.2.1 Metal Targets

Figure 2-3. Metal Targets on the CY8CKIT-148-COIL



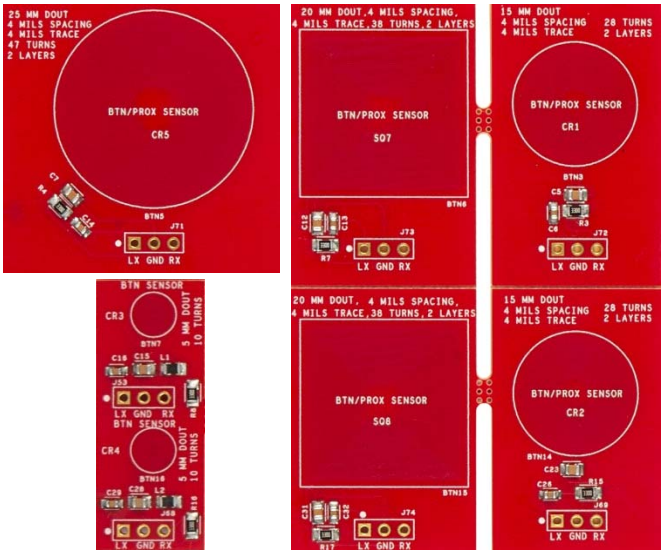

The CY8CKIT-148-COIL kit contains four metal targets, each with a different size or shape. The metal targets are meant to be broken away from the kit board and moved into the magnetic field of the desired inductive sensor.

METAL TARGET 2 as shown in Figure 2-3 is a linear target designed to be moved horizontally across a sensor. As the target moves horizontally across the sensor, the sensor signal will also change linearly.

METAL TARGET 4 (Rotary Target) is a 119° arc circular target. This target can be used with the rotary encoder sensor to determine rotational position of the metal target over the sensor.

### 2.2.2 Multi-purpose Sensors (CR1-CR5, SQ7, SQ8)

Figure 2-4. Multi-purpose Sensors (CR1-CR5, SQ7, SQ8)




The CY8CKIT-148-COIL kit contains seven multi-purpose sensors. These sensors may be used for either proximity detection or button replacement applications.

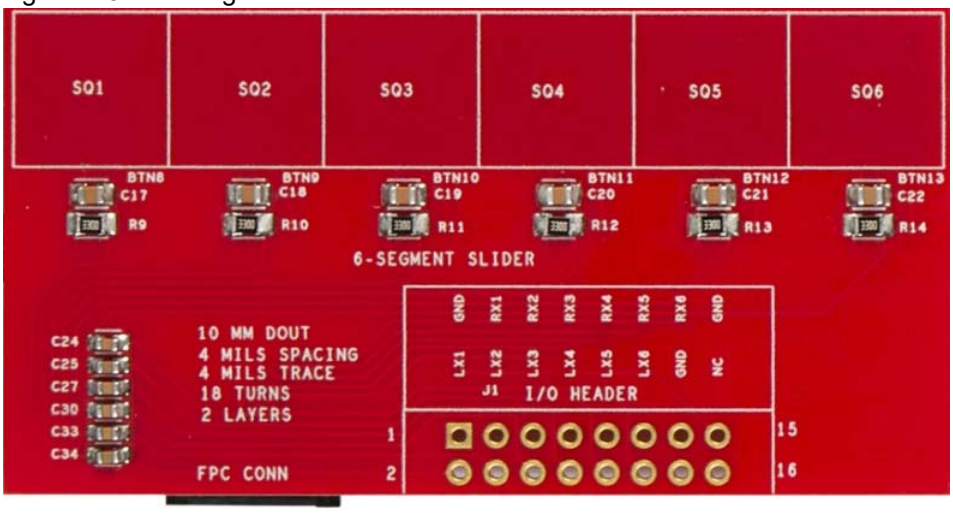
CR1 and CR2 are 15 mm circular multi-purpose sensors. CR3 and CR4 are 5 mm circular multi-purpose sensors and CR5 is a 25 mm circular multi-purpose sensor.

SQ7 and SQ8 are 20 mm square multi-purpose sensors.

Each multi-purpose sensor is capable of detecting conductive targets in close proximity to or in contact with the sensor.

### 2.2.3 Six-Segment Slider (SQ1-SQ6)

Figure 2-5. Six-Segment Slider




The CY8CKIT-148-COIL kit includes an array of six 10 mm square coils. These coils can be directly connected to the CY8CKIT-148 EVK using the FPC connector. These coils can detect horizontal position of a target above each sensor as well as gestures such as a horizontal slide.

### 2.2.4 Linear Encoder (LE1, LE2)

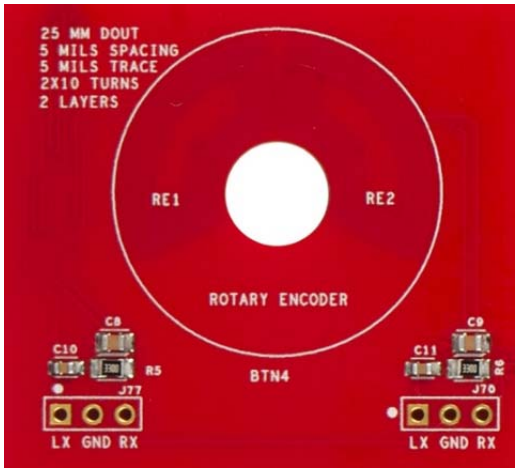
Figure 2-6. Linear Encoders




There are two 100 mm × 8 mm linear encoder coils. These coils detect horizontal movement of a METAL TARGET 2 above the sensors.

### 2.2.5 Rotary Encoder (RE1, RE2)

Figure 2-7. Rotary Encoder




There is a single rotary encoder on the kit. The rotary encoder consists of two 120° arc angle sensors placed adjacent to each other. The strength of the sensor signal acquired by turning METAL TARGET 4 over the sensors is translated in to rotational angle. For a description of the algorithm used to detect the rotational angle, see CE225409 - PSoC 4700S MagSense COIL.

## 2.3 Sensor Parameters and Recommended Settings

The following table provides the inductance values of each coil on the kit as well as the resonant frequency of each sensor. Recommended MagSense Component configuration settings are provided as well.

Table 2-1. Sensor Parameters and Recommended Settings

| Sensor Parameters | | | Recommended Component Configuration | | |
|---|---|---|---|---|---|
| **Sensor** | **Inductance (µH)** | **Resonant Frequency (kHz)** | **Lx Clock Frequency (kHz)** | **IDAC Value** | **Sub-Conversions** |
| LE1, LE2 | 28.8 | 653.0 | 648.65 | 71 | 600 |
| RE1, RE2 | 4.32 | 522.8 | 500 | 11 | 300 |
| CR1, CR2 | 22.5 | 765.3 | 750 | 45 | 600 |
| CR3, CR4 | 0.89 + 2.2[a] | 625.1 | 600 | 15 | 500 |
| CR5 | 113.9 | 329.0 | 320 | 39 | 300 |
| SQ1-SQ6 | 7.0 | 641.0 | 615.38 | 26 | 624 |
| SQ7, SQ8 | 65.2 | 437.0 | 466.02 | 51 | 585 |

a. Additional inductor in series (The on-board components L1 and L2 are in series with the coil traces).

In general, it is good practice to set the Component Lx clock frequency to a value slightly lower to the resonant frequency of the sensing tank circuit. In some cases, Lx clock frequency values above the center frequency may be used as the circuit has better performance at different frequencies.

## 2.4 Code Example

The code example CE225409 – PSoC 4700S MagSense COIL demonstrates how to use each of the coil types on the CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board with the CY8CKIT-148 Inductive Sensing Evaluation Kit. There are five projects available in this code example:

- 6-Segment Slider
- Linear Encoder
- Linear Target
- Rotary Encoder
- Proximity Sensor

Each project is designed for a specific sensor. Refer the code example document for details.

# A. Appendix

## A.1 Board Details

The CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board consists of seven types of sensors. The functionalities of all the sensors is described in Kit Operation chapter on page 18. You need to know how these sensors are connected to the on-board FPC connectors or I/O headers. See the mapping between the notation of individual sensor type to the reference designator and corresponding on-board header/connector in the Table A-1.

## A.2 Header/Connector Details

The Coil Breakout Board has two FPC connectors and several unpopulated headers to hookup the sensors with the CY8CKIT-148 kit. See Table A-1 and "Header Connections" on page 25 to know the pin-mapping between this breakout board and the main CY8CKIT-148 board.

Table A-1. Reference designators, notations and headers/connectors of individual sensors

| Sl No | Coil | Notation | REF DES | Header | FPC Connector |
|---|---|---|---|---|---|
| 1 | ROTARY ENCODERS | RE1 | BTN4 | J77 | J2 |
| | | RE2 | | J70 | |
| 2 | 25 MM CIRCULAR | CR5 | BTN5 | J71 | |
| 3 | LINEAR ENCODERS | LE1 | BTN1 | J75 | |
| | | LE2 | BTN2 | J76 | |
| 4 | 5 MM CIRCULAR | CR3 | BTN7 | J53 | Sensors not connected to any FPC connector |
| | | CR4 | BTN16 | J68 | |
| 5 | 15 MM CIRCULAR | CR1 | BTN3 | J72 | |
| | | CR2 | BTN14 | J69 | |
| 6 | 20 MM SQUARE | SQ7 | BTN6 | J73 | |
| | | SQ8 | BTN15 | J74 | |
| 7 | 6-SEGMENT SLIDERS | SQ1, SQ2, SQ3, SQ4, SQ5, SQ6 | BTN8, BTN9, BTN10, BTN11, BTN12, BTN13 | J1 | J3 |

### A.2.1 Header Connections

In addition to the FPC connector (J3), a 16-pin I/O header (J1) is provided to interface the 6-segment slider with the coil expansion connector (J4) on the CY8CKIT-148 base board.

Figure A-1. I/O header connector on the Inductive Sense Breakout board

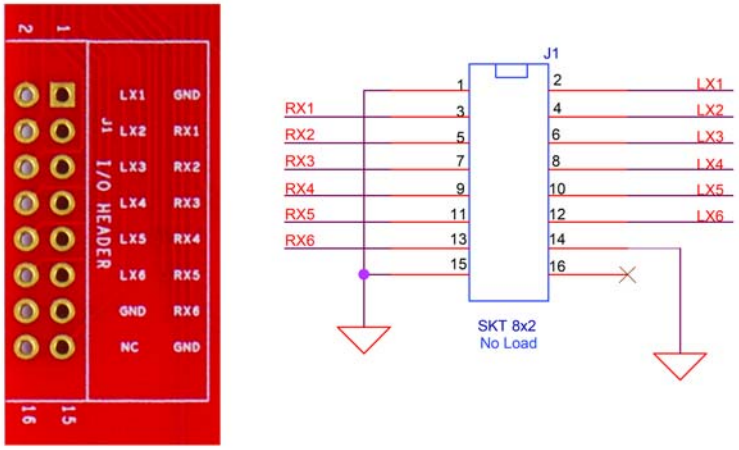



Figure A-2. Coil expansion connector on the CY8CKIT-148

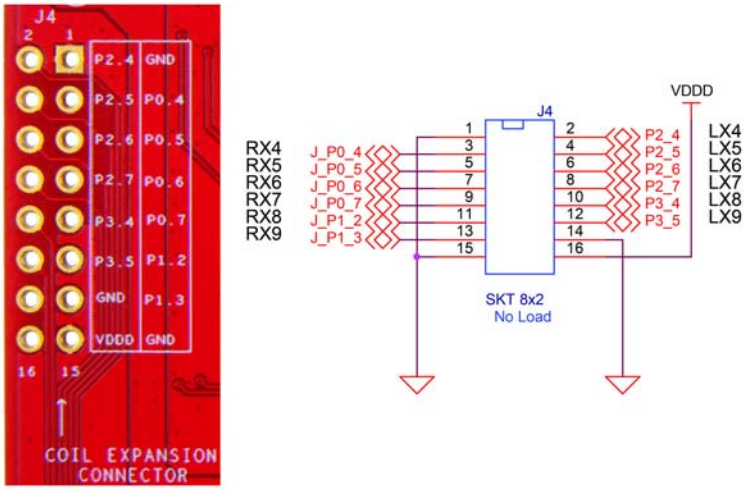
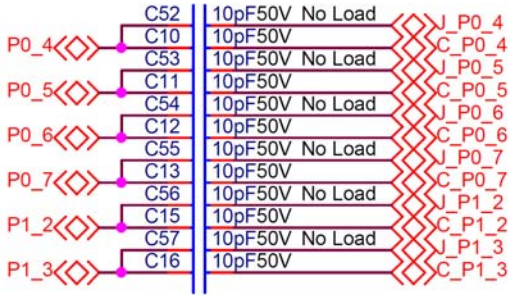



Figure A-3. Coupling capacitors of the RX connections on the CY8CKIT-148 board




The pins of J4 on CY8CKIT-148 are multiplexed with the pins of the FPC connector (J6). See the kit guide of CY8CKIT-148 to learn more about the connection details. To interface the sensors through the I/O headers, remove the capacitors C10, C11, C12, C13, C15, C16, and load the capacitors C52, C53, C54, C55, C56, C57 on the CY8CKIT-148 board.

See Table A-2 for pin mapping of the 16-pin headers (CY8CKIT-148 kit and the coil breakout board).
If you want to evaluate the sensors connecting through the headers, refer Table A-2 and Figure A-3 to know the required connection modifications.

Table A-2. Pin mapping of the coil expansion connector of the CY8CKIT-148 board and I/O headers of the CY8CKIT-148-COIL board

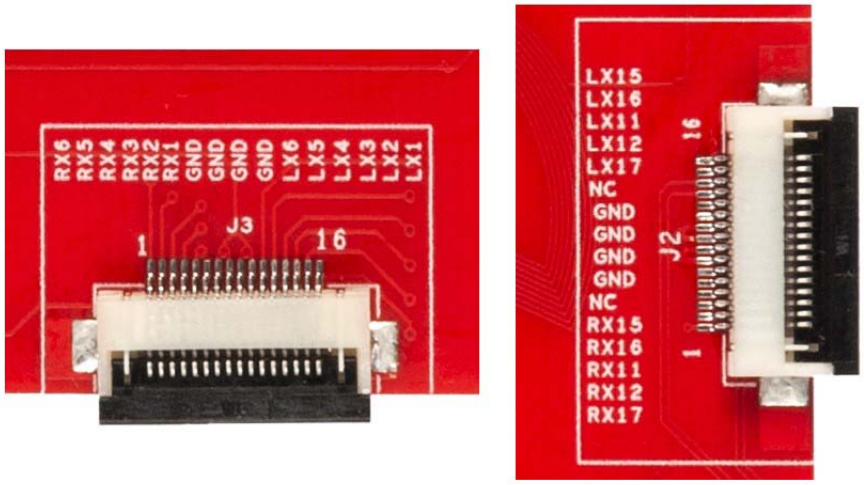
| CY8CKIT-148-COIL | | | CY8CKIT-148 | | Hardware connection modification on CY8CKIT-148 |
|---|---|---|---|---|---|
| I/O Header (J1) of Slider (SQ1–SQ6)[a] | | | Coil Expansion Connector (J4) | | |
| Pin | Sensor Trace | Coil Name | Header pin | PSoC 4700S device pin | |
| 1 | GND | N/A | 1 | GND | |
| 2 | LX1 | SQ1 | 2 | P2.4 | |
| 3 | RX1 | SQ1 | 3 | P0.4 | Remove C10 and populate C52 |
| 4 | LX2 | SQ2 | 4 | P2.5 | |
| 5 | RX2 | SQ2 | 5 | P0.5 | Remove C11 and populate C53 |
| 6 | LX3 | SQ3 | 6 | P2.6 | |
| 7 | RX3 | SQ3 | 7 | P0.6 | Remove C12 and populate C54 |
| 8 | LX4 | SQ4 | 8 | P2.7 | |
| 9 | RX4 | SQ4 | 9 | P0.7 | Remove C13 and populate C55 |
| 10 | LX5 | SQ5 | 10 | P3.4 | |
| 11 | RX5 | SQ5 | 11 | P1.2 | Remove C15 and populate C56 |
| 12 | LX6 | SQ6 | 12 | P3.5 | |
| 13 | RX6 | SQ6 | 13 | P1.3 | Remove C16 and populate C57 |
| 14 | GND | N/A | 14 | GND | |
| 15 | GND | N/A | 15 | GND | |
| 16 | NC | N/A | 16 | VDDD | |

a. The Table A-2 is an example of interfacing the slider (SQ1 to SQ6) of CY8CKIT-148-COIL to PSoC 4700S device on CY8CKIT-148 through I/O header. If you want to connect any other sensor through header, populate the on-board I/O header as per the Table A-1 and do the hardware connection modification on CY8CKIT-148 as per Table A-2.

## A.2.2 FPC Connector

There are two FPC Connectors provided on-board and an FPC cable. The FPC connectors and cable are required for this kit to connect to the CY8CKIT-148 kit. FPC connectors are low noise connectors which are good for MagSense functionality.

Figure A-4. On board FPC connectors




See Table A-3 to know the PSoC 4700S pin connections to the header mapping between the CY8CKIT-148 kit and the coil breakout board.

Table A-3. Pin mapping of the FPC connectors (CY8CKIT-148 kit and the coil breakout board)

| CY8CKIT-148-COIL | | | | | | CY8CKIT-148 | |
|---|---|---|---|---|---|---|---|
| FPC connector 1 (J3) | | | FPC connector 2 (J2) | | | FPC connector (J6) | |
| Pin | Sensor Trace | Coil Name | pin | Sensor Trace | Coil Name | Connector pin | PSoC 4700S device pin |
| 1 | LX1 | SQ1 | 1 | LX15 | LE1 | 1 | P2.4 |
| 2 | LX2 | SQ2 | 2 | LX16 | LE2 | 2 | P2.5 |
| 3 | LX3 | SQ3 | 3 | LX11 | RE2 | 3 | P2.6 |
| 4 | LX4 | SQ4 | 4 | LX12 | CR5 | 4 | P2.7 |
| 5 | LX5 | SQ5 | 5 | LX17 | RE1 | 5 | P3.4 |
| 6 | LX6 | SQ6 | 6 | NC | N/A | 6 | P3.5 |
| 7 | GND | N/A | 7 | GND | N/A | 7 | GND |
| 8 | GND | N/A | 8 | GND | N/A | 8 | GND |
| 9 | GND | N/A | 9 | GND | N/A | 9 | GND |
| 10 | GND | N/A | 10 | GND | N/A | 10 | GND |
| 11 | RX1 | SQ1 | 11 | NC | N/A | 11 | P0.4 |
| 12 | RX2 | SQ2 | 12 | RX15 | LE1 | 12 | P0.5 |
| 13 | RX3 | SQ3 | 13 | RX16 | LE2 | 13 | P0.6 |
| 14 | RX4 | SQ4 | 14 | RX11 | RE2 | 14 | P0.7 |
| 15 | RX5 | SQ5 | 15 | RX12 | CR5 | 15 | P1.2 |
| 16 | RX6 | SQ6 | 16 | RX17 | RE1 | 16 | P1.2 |

## A.3 CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board Schematics and the Bill of Materials

The schematic and the BoM of the CY8CKIT-148-COIL board is available at the kit webpage.

# Revision History

## Document Revision History

| Document Title: CY8CKIT-148-COIL Inductive Sensing Coil Breakout Board Kit Guide<br>Document Number: 002-26890 | | | | |
|---|---|---|---|---|
| **Revision** | **ECN Number** | **Issue Date** | **Origin of Change** | **Description of Change** |
| ** | 6568143 | 05/06/2019 | TAVA / BFMC | Initial Release. |