# CY3280-BBM Universal CapSense™ Prototyping Module Kit Quick Start

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# Contents



# 1. Kit Contents

- CY3280-BBM Universal CapSense™ Prototyping Module
- CY3280-BBM Universal CapSense™ Prototyping Module Kit CD
- CY3280-BBM Quick Start Booklet

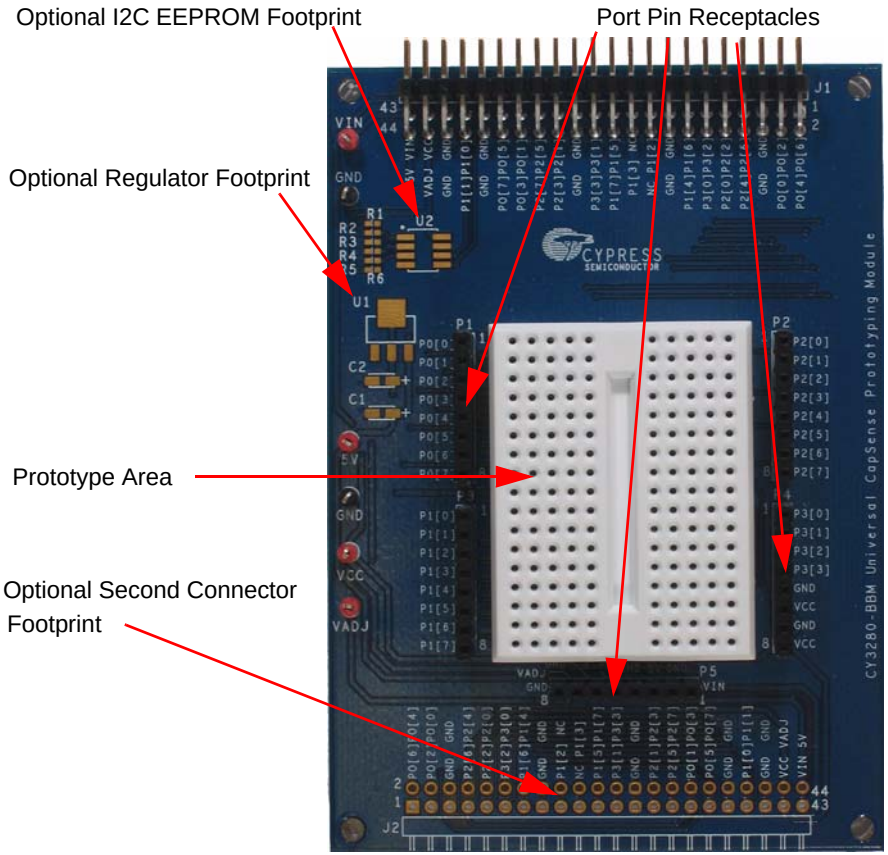
# 2. CY3280-BBM Kit CD Contents

- Hardware schematics
- Gerber files
- CapSense documentation

# 3. Getting Started

The CY3280-BBM Universal CapSense™ Prototyping Module provides access to every signal routed to the 44-pin connector on the attached controller board(s). Use the Prototyping Module board in conjunction with a Universal CapSense Controller board to implement additional functionality that is not part of the other single-purpose Universal CapSense Module boards.

## CY3280-BBM Bread Module



# 4. Review CapSense Best Practices

The Universal CapSense Controller was created using the best practices for CapSense layout. To enable universality and development of the kit and its projects, certain design elements have been changed from what is recommended for final products. Below is a list of the design features in the Universal CapSense Controller and what to change for final products.

| Design Feature | Reason | Impact | Recommended Change |
|---|---|---|---|
| Sensing traces routed through a connector to sensors. | Buttons, sliders, and LEDs are placed on the module board to allow for greater flexibility with custom modules for development and subsequent releases. | Connectors increase the parasitic capacitance of the sensors, effectively reducing their sensitivity. Connectors also create another path for noise to enter the system. | Sensors and control circuitry should be located on the same printed circuit board. Lower parasitic capacitance by reducing trace lengths. |
| Sensing traces routed to other schematic elements. | Universality of the board enabled by population/ depopulation of 0-Ω resistors. | Solder pads of 0-Ω resistors increase parasitic capacitance. | Route traces directly to sensing elements. Use as few 0-Ω resistors as possible. |
| Sensing traces located on the top layer. | Using vias to route traces to bottom of board and back to connector increases parasitic capacitance. | Possible noise sensitivity to stimulus on top side of board. Finger presses on routing of control board can lead to sensor activation. | Route sensing traces on non-user side of printed circuit board. Route sensing traces as far from noise sources as possible. |
| Several regulators used, including a variable regulator. | Demonstration of CapSense at several voltages. | Global and User Module parameters may need to be verified with changing power supply. | Supply one regulated voltage to PSoC. |
| Test point on CMOD. | Accessibility of charge/ discharge waveforms. | A test point increases noise sensitivity by acting as an antenna. | Solder pad test points for leads offer better noise immunity if test points are required. |

| Design Feature | Reason | Impact | Recommended Change |
|---|---|---|---|
| GND spacing is generalized for noise immunity and sensitivity. | Universality of kit required middle-ground on many parameters. | Design is not optimized for high-noise or very thick overlays. | Increase spacing for thicker overlays and better sensitivity. Decrease spacing for greater noise immunity. |
| Connection to shield electrode is through a jumper. | Flexibility of module boards for both CSD and CSA control boards. | Higher resistance paths can impair performance of shield electrode in CSD projects. | Dedicated trace for shield electrode. Remove jumpers wherever possible. |
| ESD protection circuitry is not included. | Development/evaluation platform without consistent overlay is inherently vulnerable to ESD events. | Direct or air-separated ESD testing may impair operation or damage circuitry. +/-2kV limit on PSoC pins (see datasheet). | Include an overlay and ESD protection circuitry. |
| User Module Parameters set to supplied overlay thicknesses. | Projects optimized for supplied hardware. | Sensitivity may not be high enough for very thick overlays. | Thicker overlays may require verification of parameters to ensure proper operation. |
| Unused pins are not routed directly to GND. | Pins brought out to connector for subsequent modules or custom designs. | Possible noise path. | Tie unused sensing traces directly to ground. |
| 0-Ω Resistors populated throughout. | Universality of the board enabled by population/ depopulation of 0-Ω resistors. | Solder pads of 0-Ω resistors increase parasitic capacitance. | Route traces directly to sensing elements. Use as few 0-Ω resistors as possible. |

# 5. Explore Additional CapSense Resources

Cypress provides a wealth of information about CapSense, and more is frequently added. Many sample documents, schematics, layouts, guidelines, and other CapSense documents are available on the CD and the others are at www.cypress.com. To find documentation online:

a. Go to www.cypress.com.
b. Click on the **Documentation** link.
c. Select the type of documentation you are looking for from the **Resource Types** list.
d. Type the part number or document number into the **Search in Design Resources** field.
e. Click the **Search** button  .

### *CapSense DataSheets*

- CY8C20x34, Up to 28 IOs for Touch Sensing (CSA), LEDs, and GPIOs
- CY8C21x34, Up to 28 IOs for Touch Sensing (CSD), LEDs, and GPIOs
- CY8C24x94, Up to 56 IOs for Touch Sensing (Supports Multiple CapSense Methods) and Full Speed USB Compliant

### *CapSense Application Notes*

- AN2292, Layout Guidelines for PSoC™ CapSense
- AN2318, EMC Design Considerations for PSoC CapSense Applications
- AN2394, CapSense Best Practices
- AN2397, CapSense Data Viewing Tool
- AN2403, Signal-to-Noise Ratio Requirement for CapSense Applications
- AN14459, CapSense Device and Method Selection Guide
- AN2360, Capacitive Sensing - Power and Sleep Considerations
- AN2398, Capacitance Sensing - Waterproof Capacitance Sensing

## *CapSense Technical Articles*

- *Designer's Guide to Rapid Prototyping of Capacitive Sensors on any Surface*

  This article discusses how to replace the mechanical buttons on a product with a smooth and sleek touch-sensitive surface. It presents the concept of prototyping capacitive sensors on any nonconductive surface using silver-ink pens and copper tape. Topics included are capacitive sensor basics, silver-ink and copper tape, and construction technique. Measured results are presented for sensors applied to the back side of a simple acrylic sheet. To read more on this topic, click the download links above or view the full article on www.PlanetAnalog.com.

- *Controls & Sensors: Touch Sensors Spread Out*

  With all the recent excitement about capacitive sensing in portable media players, laptop PCs and mobile handsets, it is easy to forget that such interface technologies have been actively designed into major appliances applications for years. Significant improvements in sensing algorithms and control circuitry have expanded the suite of applications in which the technology can be implemented. Designers are seeing the value of capacitive sensing as a replacement for mechanical buttons and membrane switches, as well as discovering new, exciting applications such as touchscreens and proximity sensors. To read more on this topic, view the full article on www.ApplianceDesign.com.

- *White Paper: Cypress's CapSense Successive Approximation Algorithm*

  Successive Approximation Algorithm (CSA) is Cypress's new capacitive sensing algorithm for the CY8C20x34 PSoC device family. CSA enables the implementation of an array of capacitive sensors through switched capacitor circuitry, an analog multiplexer and digital counting functions. The hardware configuration works in conjunction with high-level software routines from the CSA User Module found in PSoC Designer to compensate for environmental and physical sensor variations.

- *The Art of Capacitive Touch Sensing*

  Touch sensors have been around for years, but recent advances in mixed signal programmable devices are making capacitance-based touch sensors a practical and value-added alternative to mechanical switches in a wide range of consumer products. This article walks through a design example of a touch-sensitive button that can be actuated through a thick glass overlay. To read more on this topic, click the download link above or view the full article on www.Embedded.com.

# Design Support and Resources

## PSoC Development Software Online

All PSoC development software tools are available for download online. For PSoC Express, visit www.cypress.com/psocexpress. For PSoC Designer, visit www.cypress.com/psocdesigner. For PSoC Programmer, visit www.cypress.com/psocprogrammer.

## PSoC Data Sheets and Application Notes

For all PSoC device data sheets and detailed application notes, many with complete starter projects, visit www.cypress.com/designresources. In the **Products** column, select “PSoC Mixed-Signal Controllers” and in the **Resource Type** column, select either “Application Notes” or “Datasheets.”

## PSoC Device Selector Guide

In the PSoC Application Notes section, search for AN2209—The Device Selection Guide for PSoC. It is a useful tool for determining exactly which PSoC device you should use for a specific design project.

## PSoC Development Tools Selector Guide

In the PSoC Application Notes section, search for AN2402—The PSoC Development Tools Selector Guide. This is a complete catalog and description of all the development tools that support PSoC devices and when to use them in your design cycle—from concept to production.

## PSoC On-Demand Training

Visit www.cypress.com/psoctraining to engage in on-demand self-paced PSoC product and development software training. Learn to design PSoC like the pros, at the introductory, intermediate, and advanced knowledge levels!

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