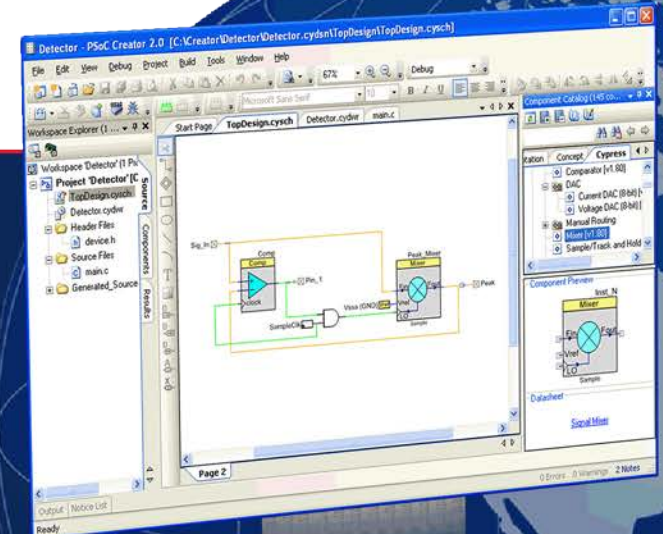




Quick Presentation: Cypress PSoC and PRoC BLE Solutions

PSoC = Programmable System-on-Chip
PRoC = Programmable Radio-on-Chip
BLE = Bluetooth Low Energy

Easily Design Low-Power, Wireless Systems
With the Industry's Most Integrated BLE Solutions



BLE Is The Choice for Short-Range, Low-Power Wireless Connectivity

Bluetooth Low Energy (BLE) is a standards-based technology

BLE is managed by the Bluetooth Special Interest Group (SIG)

BLE eliminates the need for a USB dongle¹ and provides multi-vendor interoperability

BLE is being deployed widely

BLE is now natively supported in the iOS, OS X, Android and Windows operating systems

1.2B² Bluetooth Smart Ready³ devices (see below) were sold in 2013, including iPhone, MacBook, Galaxy, Nexus and Thinkpad

165M⁴ Bluetooth Smart⁵ devices (see below) were sold in 2014 with projections to grow to 1.3B units by 2018

BLE is optimized for coin-cell battery operation

BLE is designed to communicate state or control information, not to transfer data continuously

BLE connections are quick and transient, enabling connection, data transmission and graceful disconnection in less than 3 ms

With a standard, ecosystem and very low power, BLE is the choice for short-range wireless connectivity

Bluetooth SMART READY

Smartphones Tablets



Personal Computers Televisions



Bluetooth SMART

Sports and Fitness Health and Wellness Remote Controls HID Toys



¹ External hardware that provides USB-based wireless connectivity for PCs and tablets

² Source: ABI Research

³ A brand for Bluetooth 4.0/4.1 products that support both Bluetooth Classic and BLE

⁴ Source: IHS Wireless

⁵ A brand for Bluetooth 4.0/4.1 products that support only BLE

Cypress BLE Silicon & Module Portfolio



Programmable Radio-on-Chip (PRoC™)			Programmable System-on-Chip (PSoC®)	
MCU	CapSense®	TrueTouch® ¹	Intelligent Analog	Programmable Digital
CYBL1016x PRoC BLE CM0 ³ , 2 SCBs ⁴ 36 GPIOs, 128KB Flash	CYBL1046x PRoC BLE CM0 ³ , 2 SCBs ⁴ , CapSense 36 GPIOs, 128KB Flash	CYBL1056x PRoC BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 36 GPIOs, 128KB Flash	CY8C41x7-BL PSoC 4 BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 2 CMP ⁵ , 4 Opamps 36 GPIOs, 128KB Flash	CY8C42x7-BL PSoC 4 BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 2 CMP ⁵ , 4 Opamps, 4 UDBs ⁶ 36 GPIOs, 128KB Flash
NEW CYBL1017x PRoC BLE CM0 ³ , 2 SCBs ⁴ 36 GPIOs, 256KB Flash	NEW CYBL1047x PRoC BLE CM0 ³ , 2 SCBs ⁴ , CapSense 36 GPIOs, 256KB Flash	NEW CYBL1057x PRoC BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 36 GPIOs, 256KB Flash	NEW CY8C41x8-BL PSoC 4 BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 2 CMP ⁵ , 4 Opamps 36 GPIOs, 256KB Flash	NEW CY8C42x8-BL PSoC 4 BLE CM0 ³ , 2 SCBs ⁴ , 2-Finger ¹ 2 CMP ⁵ , 4 Opamps, 4 UDBs ⁶ 36 GPIOs, 256KB Flash
Q315 CYBLE-020002-00 EZ-BLE Serial Module UART to BLE 10 x 10 x 1.80-mm SMT ⁷	NEW CYBLE-022001-00 EZ-BLE PRoC Module CM0 ³ , 2 SCBs ⁴ 16 GPIOs, 128KB Flash 10 x 10 x 1.80-mm SMT ⁷			Q315 CYBLE-024008-00 EZ-BLE PSoC Module CM0 ³ , 2 SCBs ⁴ , 4 Opamps, 1 CMP ⁵ , 4 UDBs ⁶ , 26 GPIOs, 128KB Flash 12 x 12 x 1.80 mm SMT ⁷
	Q315 CYBLE-222005-00 EZ-BLE PRoC Module CM0 ³ , 2 SCBs ⁴ 16 GPIOs, 256KB Flash 10 x 10 x 1.80-mm SMT ⁷			Q415 CYBLE-224009-00 EZ-BLE PSoC Module CM0 ³ , 2 SCBs ⁴ , 4 Opamps, 1 CMP ⁵ , 4 UDBs ⁶ , 26 GPIOs, 256KB Flash 12 x 12 x 1.80 mm SMT ⁷

Integration

¹ Touch-sensing technology with 2-finger gestures referred to as 2-Finger
² Bluetooth Low Energy, also known as Bluetooth Smart
³ ARM® Cortex®-M0
⁴ Serial communication block

⁵ Comparator
⁶ Universal digital block
⁷ Surface mount technology

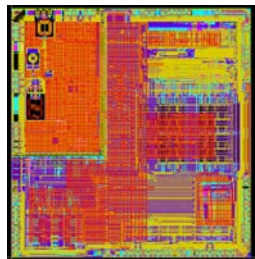


Cypress Provides a Complete BLE Solution

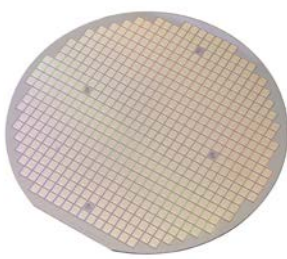
Cypress is the only BLE solution provider with expertise in silicon, stack, module hardware and software

Solution Discipline	Cypress	BLE Module Suppliers			BLE Silicon Suppliers ¹
		Microchip	Panasonic	Bluegiga	
BLE Silicon Design	✓				✓
BLE Wafer Fabrication	✓				✓
BLE Silicon Package Assembly/Test	✓				✓
BLE Stack Development	✓				✓
Software (IDE)	✓				✓
BLE Module Hardware Design	✓	✓	✓	✓	
BLE Module Manufacturing	✓	✓	✓	✓	

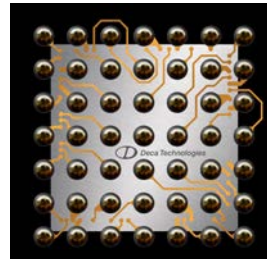
BLE Silicon Design



BLE Wafer Fabrication



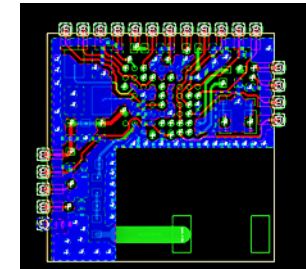
BLE CSP Package²



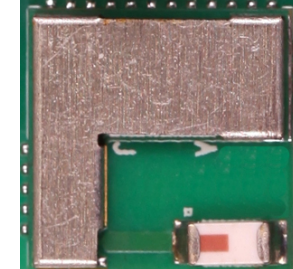
PSoC Creator Software



Module Hardware Design



EZ-BLE PSoC Module



Cypress is the end-to-end expert for all of your BLE needs

¹ Nordic, TI, CSR, Dialog

² Chip-scale package (CSP) manufactured by Cypress subsidiary Deca Technologies Inc.

PSoC[®] 4 BLE (CY8C4xxx-BL)

Programmable System-on-Chip with Bluetooth Low Energy



Applications

Sports and fitness monitors, wearable electronics, medical devices, home automation solutions, game controllers, sensor-based low-power systems for IoT

Features

32-bit MCU subsystem

48-MHz ARM[®] Cortex[®]-M0 CPU
Up to 256KB flash and 32KB SRAM

Programmable AFE¹

Four opamps, configurable as PGAs, comparators, filters, etc.
One 12-bit, 1-Msps SAR² ADC

CapSense[®] with SmartSense[™] Auto-tuning

One Cypress Capacitive Sigma-Delta[™] (CSD) controller with touchpad capability

Programmable digital logic

Four universal digital blocks (UDBs): custom digital peripherals
Four configurable TCPWM³ blocks: 16-bit timer, counter or PWM
Two configurable serial communication blocks (SCBs):
I²C master or slave, SPI master or slave, or UART

Packages

56-pin QFN, 68/76-ball CSP

Bluetooth Smart connectivity with Bluetooth 4.1

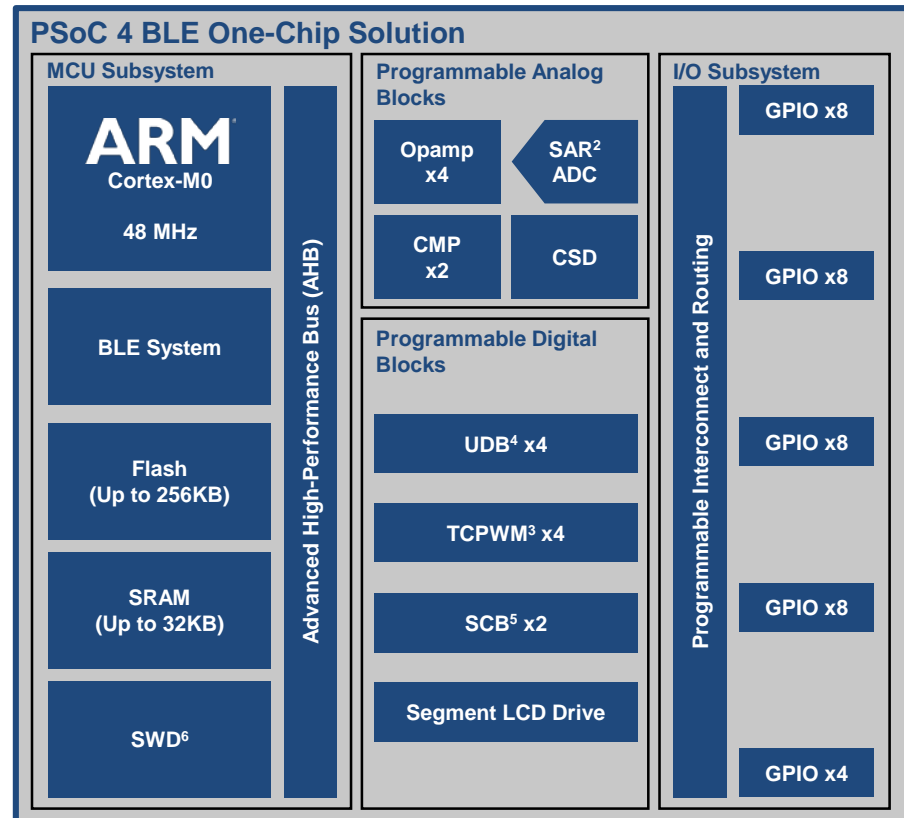
2.4-GHz BLE radio with integrated Balun

Collateral

[Datasheet](#)

[Application Notes](#)

Block Diagram



Availability

Sampling: 128KB: Now, 256KB: Q215

Production: 128KB: Now, 256KB: Q315

¹ Analog front end(s)

³ Timer, counter, pulse-width modulator

⁵ Serial communication block configurable as I²C/SPI/UART

² Successive approximation register

⁴ Universal digital block

⁶ Serial wire debug communication protocol

PRoC™ BLE (CYBL101x/4x/5xx)

Programmable Radio-on-Chip with Bluetooth Low Energy



Applications

- Wireless touch mice
- Wireless keyboards with trackpads
- Wireless trackpads
- Wireless remote control with trackpads
- BLE connectivity
- Wireless toys

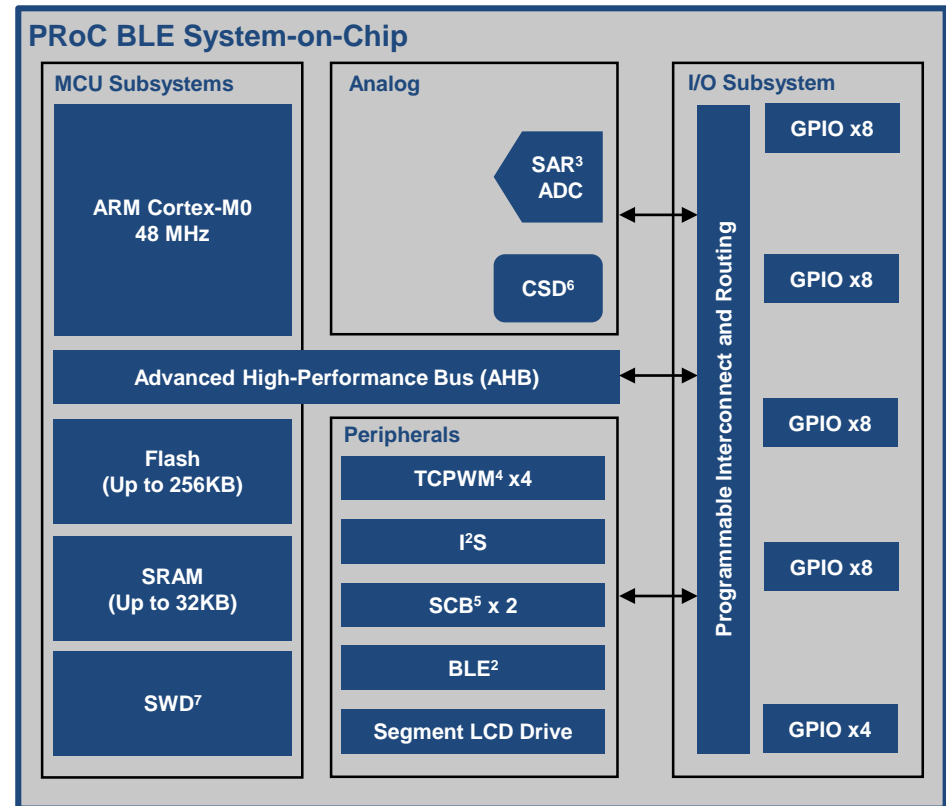
Features

- 48-MHz ARM® Cortex®-M0 MCU
- Up to 256KB Flash, 32KB SRAM, 36 programmable GPIOs¹
- Bluetooth Smart connectivity with Bluetooth 4.1:
 - 2.4-GHz BLE² radio and baseband with integrated Balun
 - 91-dBm Rx sensitivity, +3-dBm Tx output power
- Modes: 1.3-µA Deep-Sleep, 150-nA Hibernate, 60-nA Stop
- Analog and digital peripherals:
 - One 12-bit, 1-Msps SAR³ ADC
 - Four 16-bit TCPWM⁴ blocks
 - Two SCBs⁵, configurable as I²C, SPI or UART
 - I²S for audio input
 - Flexible mapping onto GPIOs
- Integrated library support for one- and two-finger gestures
- 56-QFN, 68/76-ball CSP packages

Collateral

[Datasheet](#)
[Application Notes](#)

Block Diagram



Availability

Sampling: 128KB: Now, 256KB: Q215
Production: 128KB: Now, 256KB: Q315

¹ General-purpose input/output (configurable)

² Bluetooth Low Energy, also known as Bluetooth Smart

³ Successive approximation register

⁴ Timer, counter, pulse-width modulator

⁵ Serial communication blocks

⁶ Capacitive Sigma-Delta controller

⁷ Serial wire debug communication protocol

EZ-BLE P_{RoC}™ Module

Bluetooth Low Energy Module using P_{RoC} BLE



Applications

BLE¹ connectivity
Medical
Industrial
PC accessories
Toys
Smartphone accessories

Features

Qualification and certification:

Bluetooth SIG QDID²
FCC³, CE⁴, KC⁵, MIC⁶ and IC⁷

Small footprint:

10 mm x 10 mm x 1.8 mm, 21-pad SMT with 16 GPIO

Bluetooth Smart connectivity with Bluetooth 4.1:

2.4-GHz BLE radio and baseband
-91-dBm Rx sensitivity, +3-dBm Tx output power

Power modes:

1.3-µA Deep-Sleep, 150-nA Hibernate, 60-nA Stop

Highly integrated solution:

Two crystals, chip antenna, passives, shield

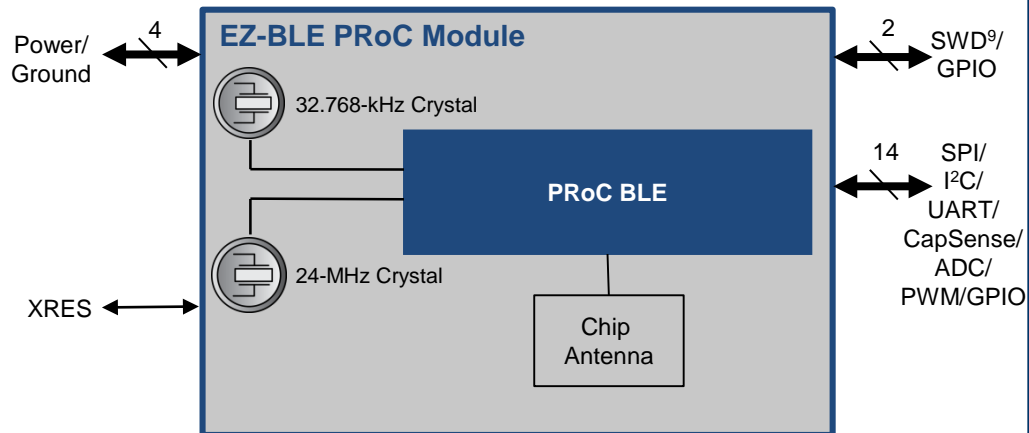
CYBLE-022001-EVAL adapter board interface:

Easy interface to CY8CKIT-042-BLE Pioneer Kit
Enables testing of CapSense, buttons, GPIOs, OTA⁸

Availability

Sampling: Now
Production: Q215

Block Diagram



Collateral

[EZ-BLE P_{RoC} Module Datasheet](#)

[P_{RoC} BLE Datasheet](#)

[Getting Started Application Note](#)

[PSoC Creator](#)

[PSoC Programmer](#)

[CySmart¹⁰ Windows Host Emulation Tool](#)

[CySmart iOS and Android Apps](#)

¹ Bluetooth Low Energy, also known as Bluetooth Smart

² Bluetooth Special Interest Group Qualification Design ID

³ Federal Communications Commission

¹⁰ A GUI-based software tool that installs on your PC to test and debug BLE functionality; also available in iOS and Android mobile applications

⁴ Conformité Européenne (Europe)

⁵ Korea Certification

⁶ Ministry of Internal Affairs and Communications (Japan)

⁷ Industry Canada

⁸ Over-the-Air

⁹ Serial wire debug communication protocol

PRoC™ BLE Solution Example: Remote Control

Cypress Solution Value

Design Challenges

Advanced features: trackpad, voice, motion sensing
Very low cost
Seamless Touch Sensing¹ and RF

PRoC BLE Solution

Provides support for advanced features:

- Trackpad with two-finger gestures
- Voice commands over BLE
- Six-axis motion sensing

Integrates BLE radio, microcontroller and touch sensing¹
Integrates balun to reduce external RF components
Allows two-layer PCB design
Delivers high signal-to-noise ratio with SmartSense™
Auto-tuning²

Collateral

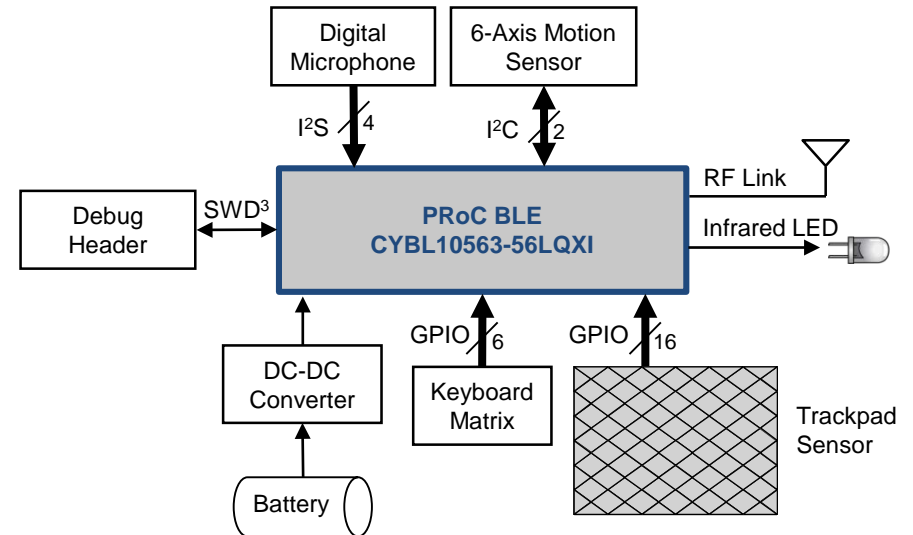
Kit Website: [PRoC BLE Remote Control](#)
Kit User Guide: [CY5672 User Guide](#)
Datasheet: [PRoC BLE Datasheet](#)
App Note: [Getting Started with PRoC BLE](#)

How To Get Started

Buy a [Remote Control RDK](#) (CY5672)
Download [PSoC Creator](#)
Download the [Kit installer file](#)

Block Diagram

BLE Remote Control



PRoC BLE Remote Control RDK

Supports BLE HID Profile,
two-finger gestures, voice
command, six-axis motion
sensing, Infrared LED and
10 buttons



¹ A technology based on capacitive coupling that recognizes human touch as an input protocol

² An algorithm that enables CapSense buttons to continuously compensate for system, manufacturing and environmental changes

³ Serial wire debug communication protocol

PRoC™ BLE Solution Example: Touch Mouse

Cypress Solution Value

Design Challenges

Low cost
Seamless touch sensing¹ and RF
One-year battery life

PRoC BLE Solution

Integrates BLE radio, microcontroller and touch sensing¹
Integrates balun to reduce external RF components
Provides two-layer PCB design
Delivers SmartSense™ Auto-tuning² with high signal-to-noise ratio
Provides flexible power modes for one-year battery life

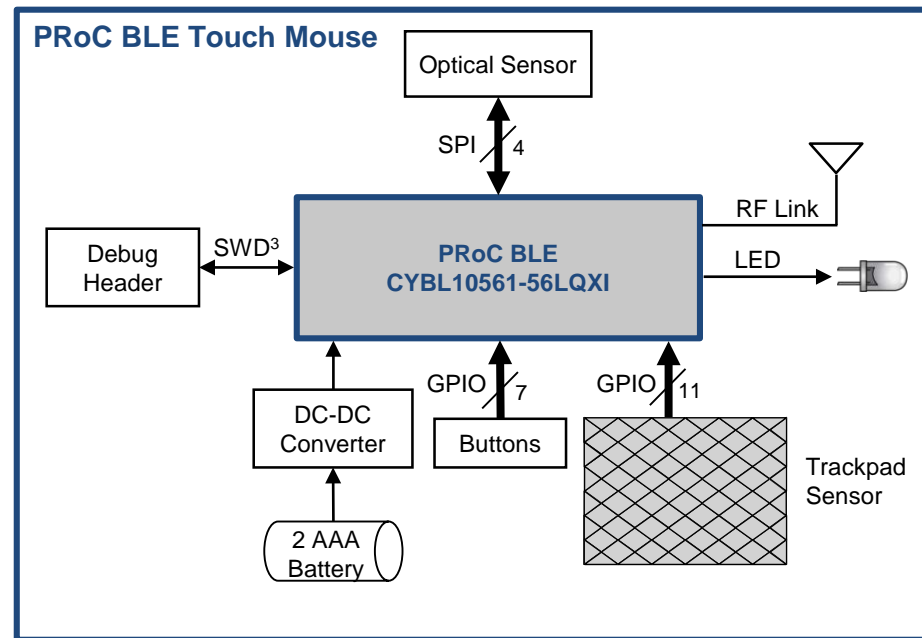
Collateral

Kit Website: [PRoC BLE Touch Mouse](#)
Kit User Guide: [CY5682 User Guide](#)
Datasheet: [PRoC BLE Datasheet](#)
App Note: [Getting Started with PRoC BLE](#)

How To Get Started

Buy a [Touch Mouse RDK](#) (CY5682)
Download [PSoC Creator](#)
Download the [Kit installer file](#)

Block Diagram



PRoC BLE Touch Mouse RDK

Supports Windows 8-specific
gestures and scrolling on
Touch Sensing sliders



¹ A technology based on capacitive coupling that recognizes human touch as an input protocol

² An algorithm that enables CapSense buttons to continuously compensate for system, manufacturing and environmental changes

³ Serial wire debug communication protocol

Getting Started With BLE

1. Download the PSoC Creator IDE:

www.cypress.com/Creator

2. Buy the \$49 BLE Pioneer Kit and the \$15 plug-in module(s)¹

www.cypress.com/CY8CKIT-042-BLE

3. Download the *Getting Started App Note*

PSoC 4 BLE www.cypress.com/go/AN91267

PRoC BLE www.cypress.com/go/AN94020

EZ-BLE PRoC www.cypress.com/go/AN96841

BLE Pioneer Kit provides simple, rapid development

Compatible form factor with Arduino® shields and Digilent® Pmod™ daughter cards

Includes two FCC-certified² BLE modules

PSoC 4 BLE module (also sold separately as CY8CKIT-141)

PRoC BLE module (also sold separately as CY5671)

Features onboard CapSense slider, RGB LED and push buttons

Provides direct access to all device GPIOs

Selectable voltage setting of 1.9 V, 3.3 V or 5 V

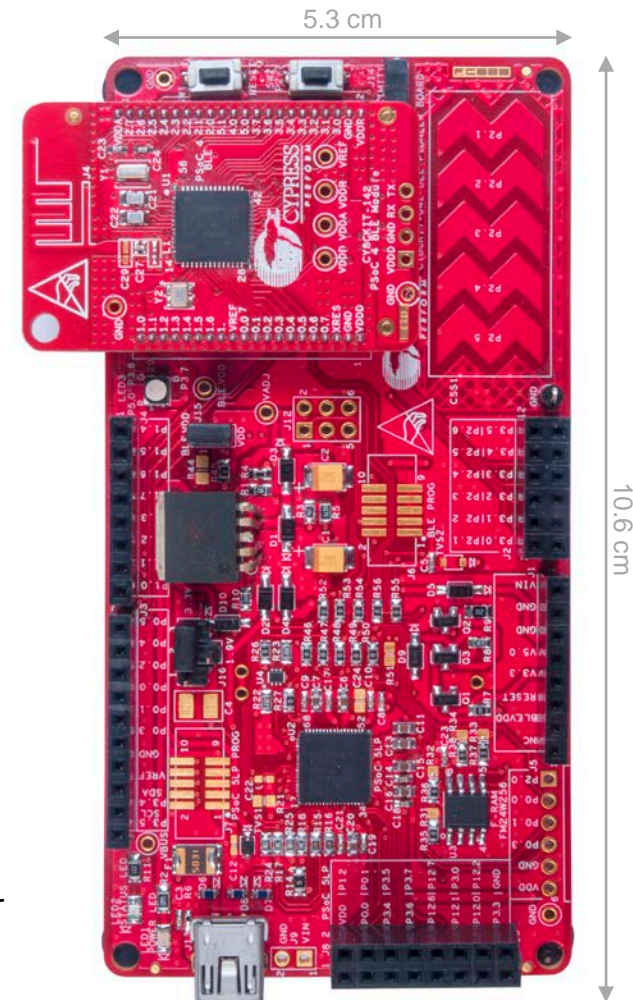
BLE Pioneer Kit provides an advanced debug interface

Includes an on-board PSoC 5LP, factory-programmed as a programmer and debugger

Serial wire debug interface over USB

USB-to-serial interface

BLE Pioneer Kit (CY8CKIT-042-BLE)



¹ The BLE Pioneer Kit includes PSoC 4 BLE and PRoC BLE 128KB Flash Modules. The PSoC 4 BLE or PRoC BLE 256KB Flash modules can be purchased separately for \$15 each

² A mark on electronic products manufactured or sold in the U.S. certifying that its electromagnetic interference is under limits defined by the Federal Communications Commission