Frequently Asked Questions

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Product Family Features

Q1. What do the acronyms PSoC and BLE stand for?
A: PSoC = Programmable System-On-Chip
BLE = Bluetooth Low Energy
PSoC 4 BLE = PSoC 4 with BLE connectivity

Q2. What is PSoC 4 BLE? What are its key features?
A: PSoC 4 BLE is an extension to the PSoC 4 family that adds on-chip BLE. It includes:
- 32-bit, 48-MHz ARM® Cortex®-M0 CPU with 256KB flash
- 32KB SRAM
- CapSense
- 12-bit programmable analog front end, including a 1-Msps SAR ADC
- four opamps and two low-power comparators
- programmable digital blocks, including four TCPWMs\(^1\), two SCBs\(^2\), four UDBs\(^3\)
- Segment LCD Control
- 36 GPIOs

Included in PSoC 4 BLE is a royalty-free Stack compatible with Bluetooth 4.1. It provides an optimized solution for wearable electronics, sports and fitness monitors, medical devices and home automation. PSoC 4 BLE provides a simple, low-cost way to create sensor-based systems with BLE wireless connectivity.

PSoC 4 BLE comes in 56-QFN (7 x 7 x 0.6 mm), 68-ball CSP (3.9 x 3.5 x 0.55 mm) and 76-ball CSP (4.1 x 3.9 x 0.55 mm) packages with an extended temperature range (-40°C to +105°C).

Q3. What does the acronym PRoC BLE stand for?

Q4. What is PRoC BLE? What are its key features?
A: PRoC BLE is a 32-bit, 48-MHz ARM® Cortex®-M0 BLE solution with 256KB flash, 32KB SRAM, CapSense\(^{®}\), 12-bit ADC, 4 TCPWMs\(^1\), 36 GPIOs, 2 SCBs\(^2\), an LCD and I\(^{2}\)S. PRoC BLE includes a royalty-free Stack that is compatible with Bluetooth 4.1. It provides an optimized solution for HID, remote controls and toys. PRoC BLE also provides a simple, low-cost way to add BLE connectivity to any system.

PRoC BLE comes in 56-QFN (7 x 7 x 0.6 mm), 68-ball CSP (3.9 x 3.5 x 0.55 mm) and 76-ball CSP (4.1 x 3.9 x 0.55 mm) packages with an extended temperature range (-40°C to +105°C).

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\(^1\) Timer/Counter/PWM blocks
\(^2\) Serial communication blocks
\(^3\) Universal digital blocks
Q5. What is the difference between PRoC BLE and PSoC 4 BLE?
A: PRoC BLE is a configurable device optimized for key applications including HID devices, toys and games and connectivity solutions. It offers turn-key reference designs for touch-mouse and remote control applications. Designs with PRoC BLE include pre-populated schematics in the PSoC Creator IDE for quicker time-to-market. PSoC 4 BLE is a fully programmable SoC for wearable electronics, sensor interfaces and complete systems for the Internet of Things (IoT). Designs with PSoC 4 BLE are fully customizable in the PSoC Creator IDE with access to a catalog of more than 100 production-ready Components.

Q6. How much memory does the PSoC 4 BLE Stack consume?
A: About 64KB flash and 8KB SRAM are consumed by the BLE stack. About 192KB flash and 24 KB SRAM are available for the Profile and applications.

Q7. What is the operating voltage for PSoC 4 BLE including the radio?
A: 1.9 to 5.5 V. If the radio is not needed, PSoC 4 BLE can operate down to 1.71 V

Q8. Does Cypress’s BLE solution support all Profiles?
A: Yes, Cypress supports all adopted BLE Profiles.

Q9. What is the data rate for BLE vs. Bluetooth Classic?
A: Bluetooth Classic supports up to 3 Mbps, whereas BLE supports 1 Mbps.

Q10. Does Cypress’s BLE solution support coin-cell operation?
A: Yes, PSoC 4 BLE is designed for low power consumption and supports operation with 3.3-V coin-cell batteries.

Q11. Is PSoC 4 BLE available in small packages for wearable applications?
A: Yes, PSoC 4 BLE comes in three small packages: a 56-QFN (7 x 7 x 0.6 mm) and an even smaller, 68-ball CSP (3.9 x 3.5 x 0.55 mm) and 76-ball CSP (4.1 x 3.9 x 0.55 mm).

Q12. Is this product available in the industrial temperature grade “I”?
A: Yes. PSoC 4 BLE is available in the industrial temperature range (-40°C to +85°C). PSoC 4 BLE is also available in the extended temperature range (-40°C to +105°C) in selected MPNs.

System Implementation/BOM

Q13. Which crystal oscillators does a PSoC 4 BLE solution require?
A: A PSoC 4 BLE solution requires two crystals:
• 24-MHz RF crystal: A 20-ppm 24-MHz crystal is required for RF operation. Commonly used dimensions are 3.2 x 2.5 mm, 2.3 x 2 mm or 2.0 x 1.6 mm.
• **32-kHz sleep clock crystal**: A 32-kHz crystal is a sleep clock crystal. It is used to allow Cypress BLE solutions to wake up periodically at a pre-defined interval.

**Q14. Is there a way to eliminate the 32-kHz crystal from the BOM?**
**A:** A 32-kHz crystal is required for all of the applications except for a beacon-only or a broadcaster-only application, in which a connection itself is not established. PSoC 4 BLE also supports a 32-kHz input clock from another source (output from another IC in the system), eliminating the need for a 32-kHz crystal.

**Q15. Which antennas can you use with PSoC 4 BLE?**
**A:** You can use virtually any type of 50-Ω, 2.4-GHz antenna, including these popular types:
- Printed trace / wiggle
- Chip
- Half-wave dipole
For more details, see the application note “PSoC 4 BLE / PRoC BLE Antenna Design Guide” at [www.cypress.com/go/AN91445](http://www.cypress.com/go/AN91445).

**Q16. Is an external Balun required for Cypress’ BLE solution?**
**A:** No, PSoC 4 BLE integrates an on-chip Balun to simplify board designs and to reduce the BOM and PCB footprint.

**Q17. How many external components does Cypress’s BLE solution require for the Antenna Matching Network (AMN)?**
**A:** PSoC 4 BLE requires only two external components for the AMN, whereas competitive solutions require up to nine external components.

**Q18. Which analog components are integrated on a PSoC 4 BLE device?**
**A:** PSoC 4 BLE enables the ability design custom analog front ends for sensor interfaces by integrating the following analog components:
- One 12-bit, 1-Msps SAR ADC with an eight-channel sequencer
- Four opamps, with operation in the Deep-Sleep, low-power mode
- Two low-power comparators, with operation in the Hibernate low-power mode
- Two iDACs

**Q19. Which digital components are integrated on a PSoC 4 BLE device?**
**A:** PSoC 4 BLE integrates the following digital components to interface with digital sensors or to control digital I/Os:
- Four TCPWMs, configurable as 16-bit PWM/timer/counter
- Two SCBs, configurable as I²C/SPI/UART
- Four UDBs, used to implement 60+ digital peripherals
Q20. Does Cypress’s BLE solution integrate CapSense?
A: Yes, PSoC 4 BLE supports CapSense on all GPIOs.

Q21. Which components are integrated on a PSoC 4 BLE device to create user interfaces?
A: PSoC 4 BLE integrates the following components to create user interfaces:
- One CapSense block to create inputs like buttons, sliders and proximity sensors
- One segment LCD block to drive LCDs

Q22. Can we write custom firmware for PSoC 4 BLE?
A: Yes, PSoC 4 BLE provides access to all of the programmable peripherals and the Cortex-M0 CPU. PSoC Creator generates APIs for all Components on the schematic.

Q23. Can we write custom firmware for PRoC BLE?
A: Yes, PRoC BLE also provides access to all available peripherals and to the Cortex-M0 CPU.

Q24. Can we program an SCB as a UART or SPI or I2C in PSoC 4 BLE?
A: Yes. Use the PSoC 4 SCB Component Configuration Tool to configure the blocks as UART, I2C or SPI.

Solution Capability

Q25. What is Bluetooth Low Energy (BLE)?
A: BLE is a standard, adopted in 2010, for short-range, low-power wireless applications that communicate state or control information for low-duty cycle operated applications. BLE operates in the 2.4-GHz ISM band with GFSK modulation, and it supports a 1-Mbps over-the-air data rate.

Q26. Is BLE backward-compatible with Bluetooth Classic?
A: No, BLE is not backward-compatible with Bluetooth Classic.

Q27. What is Bluetooth 4.1?
A: An enhancement to the Bluetooth 4.0 specification adopted in December 2013. The PSoC 4 BLE solution includes the following Bluetooth 4.1 features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Duty Cycle Advertising</td>
<td>Enables a new advertising mode to save power</td>
</tr>
<tr>
<td>32-bit Universally Unique Identifier (UUID)</td>
<td>Enables more data in an advertising packet</td>
</tr>
<tr>
<td>L2CAP Connection-Oriented Channels</td>
<td>Provides access to the lower Stack for bulk data transfer</td>
</tr>
<tr>
<td>Link Layer Ping Mechanism</td>
<td>Enables more security during pairing</td>
</tr>
<tr>
<td>BLE Privacy</td>
<td>Defines the use of random address to improve security</td>
</tr>
</tbody>
</table>
Q28. Which Bluetooth spec does Cypress’s BLE solution support?
A: Cypress’s BLE solution supports Bluetooth 4.1.

Q29. Who manages the Bluetooth standard?
A: Bluetooth is managed by the Bluetooth Special Interest Group (SIG), a not-for-profit, non-stock corporation founded in 1998 with more than 20,000 member companies. The SIG owns the Bluetooth trademarks and oversees development of Bluetooth specifications and profiles. The SIG’s main tasks are to publish the specifications, administer the qualification program, protect the trademarks and evangelize Bluetooth wireless technology. The SIG does not make, manufacture or sell Bluetooth-enabled products.

Q30. What is a Bluetooth Profile and where can I find more information?
A: A Bluetooth specification that guarantees compatibility and application interoperability between devices. The Bluetooth 4.0/4.1 specification defines how the technology works, while a Bluetooth Profile defines how it is used. For example, keyboards use the HID Profile and Heart Rate Monitors (HRMs) use the HRM Profile. Two devices must support the same Profile to communicate with one another. For more details, see the adopted Profiles on the Bluetooth SIG website.

Q31. What is the difference between single-mode and dual-mode devices?
A: A Bluetooth product supporting both Bluetooth Classic and BLE is a dual-mode device (branded as Bluetooth Smart Ready products), whereas a product supporting BLE only is called a single-mode device (branded as Bluetooth Smart products). PSoC 4 BLE is a single-mode device.

Q32. How many Bluetooth Smart products can a Bluetooth Smart Ready product connect simultaneously?
A: A Bluetooth Smart product may only be connected to a single Bluetooth Smart Ready product, but a Bluetooth Smart Ready product may be connected to multiple (no theoretical limit) Bluetooth Smart products. For example an HRM may only be connected to an iPhone; however an iPhone may simultaneously be connected to an HRM, a pedometer and a weight scale.

Q33. Does Cypress’s BLE solution allow you to create Bluetooth Smart products?
A: Yes, you can create Bluetooth Smart products with PSoC 4 BLE.
Q34. Does Cypress’s BLE solution allow you to create Bluetooth Smart-Ready (dual-mode) products?
A: No, you cannot create Bluetooth Smart-Ready products with PSoC 4 BLE. However, you can communicate with any Bluetooth Smart-Ready product using the PSoC 4 BLE solution.

Q35. Can Cypress’s BLE devices operate in both GAP Central and GAP Peripheral modes?
A: A single BLE device can perform GAP Central and GAP Peripheral roles, but not concurrently.

Q36. What is the maximum over-the-air data rate achievable with BLE?
A: BLE supports a 1-Mbps over-the-air gross data rate. However, the maximum theoretical net throughput over BLE is 319.5 kbps, with preamble, inter-frame spacing and synchronization packet overhead. The theoretical net bit rate with the protocol overhead at the application-level is 236.7 kbps for Bluetooth 4.0 and 272.1 kbps for Bluetooth 4.1.

Q37. If I am making a product with Cypress silicon, which listing should I refer to?
A: There are two cases. Case #1 is you do not intend to make any changes to Cypress’s qualified design, in which case you can reference our *end product* QDID for QFN or CSP – whichever package you use. Case #2 is that you intend to make changes to our qualified design (RF layout, removing a feature etc.), in which case you will reference our component QDIDs to create your own end product qualification for the modified design.

Q38. If an end-product is made using your BLE device, will my product be also completely BLE certified?
A: If your end-product uses Cypress’s design without any changes to the original design, then yes, the end-product is BLE qualified (tested). However, note that you still have to complete the Declaration and Listing process to claim ‘BLE certified’ for your end-product. If you make changes to Cypress’s design, then you may need to go through the qualification testing process to ensure your design is qualified.

Q39. Do you need Bluetooth qualification for end products using PSoC 4 BLE?
A: Yes. The Bluetooth Qualification and Declaration Process are mandatory for all members to complete for their product(s) incorporating Bluetooth wireless technology. Cypress already provides QDID (Qualified Design ID) for their BLE products. This qualification pertains to Controller, Host and Profiles. All members implementing PSoC 4 BLE technology into a product must complete the Product Listing and Declaration of Compliance (DoC) certification referencing QDID. As long as customers do not change the Bluetooth part of the design, a separate QDID is not required. Please visit Bluetooth Qualification and Declaration Processes for further details.
Q39.1. If I decide to make changes to your qualified design, what do I need to do for qualification?
A: If you do make changes to the design (commonly, hardware changes that impact RF layout, components, antenna gain, etc.), you first need to make an assessment to evaluate the changes and their impact on the qualified design. Based on the assessment, you will have do one of the following – (a) continue with listing if you determine that the changes do not impact the qualification status of our qualified design, or (b) repeat some or all of the qualification tests to confirm the changes do not impact the status of our qualified design and then continue to do listing after confirmation, or (c) go through a complete qualification process resulting in a new Qualified Design Listing (QDL) followed by listing. In options (a) and (b), you do not need to go through a qualification process, but only a listing process.

Q39.2. How do I assess if my changes require testing or new QDL?
A: You can do the assessment by yourself if you have the right knowledge about the design and qualification requirements to determine that the changes do not require further testing or a new QDL. If you are not sure, you can consult a BQE (Bluetooth Qualification Expert) like AT4-wireless to help you with the assessment.
- If you or add/remove features, or make other significant changes, then assume that the Bluetooth Design is not the same, and a new QDL is needed.
- In the case of other changes that do not require a new QDL but where after applying engineering analysis it is understood that the Bluetooth system can be affected by the change (i.e. HW changes impacting the Bluetooth RF), then an assessment involving testing is needed (i.e. full RF-PHY testing, partial testing, etc.)

The most important thing is being able to demonstrate that all changes (if they exist) have been properly evaluated and actions (if applicable) have been taken in order to ensure that the product still meet the requirements.

Q39.3. Summary of the three options with respect to Bluetooth Qualification
A:
(1). Reference the QDID and only need to do Declaration. Don’t need to do any testing or qualification.
(2). Reference the QDID but will have to do some testing (at BQTF or own facility using PTS) to ensure your design still remains qualified (I don’t need to do a new QDL)
(3.) Reference the Component QDID for LL, Stack, PHY and create your own QDID.

When do you recommend each of these options?
- Option 1 is recommended when no changes to our original QDL design are being done (including RF changes) in the case when you do not want to have your own QDL
- Option 2 is recommended when you make small HW/FW changes in order to use your End Products QDLs without running other changes as PICS, adding layers or adding functionality, etc. (again in the case you do not want to have your own QDL)
- Option 3 is recommended if you do want to have your own QDL or when you are doing changes to the original QDLs (PICS, adding layers or adding functionality, etc…)

List of Cypress QDIDs

<table>
<thead>
<tr>
<th>QD ID</th>
<th>Declaration ID</th>
<th>Name</th>
<th>Product</th>
<th>Product Type</th>
<th>Spec</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>63683</td>
<td>D025069</td>
<td>CSP package Bluetooth Smart device</td>
<td>CYBL10X6X, PSoC 4XX7_BLE</td>
<td>End Product</td>
<td>4.1</td>
<td>02-Dec-2014</td>
</tr>
<tr>
<td>62887</td>
<td>D024757</td>
<td>QFN package Bluetooth Smart device</td>
<td>CYBL10X6X, PSoC 4XX7_BLE</td>
<td>End Product</td>
<td>4.1</td>
<td>08-Nov-2014</td>
</tr>
<tr>
<td>62245</td>
<td>D024754</td>
<td>CYBLE RF-PHY (QFN)</td>
<td>PRoC BLE, PSoC 4 BLE</td>
<td>Component (Tested)</td>
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<td>07-Nov-2014</td>
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<td>63368</td>
<td>D025068</td>
<td>CYBLE RF-PHY (CSP)</td>
<td>PRoC BLE, PSoC 4 BLE</td>
<td>Component (Tested)</td>
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<td>02-Dec-2014</td>
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<tr>
<td>62243</td>
<td>D024755</td>
<td>CYBLE Link Layer</td>
<td>PRoC BLE, PSoC 4 BLE</td>
<td>Component (Tested)</td>
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<td>07-Nov-2014</td>
</tr>
<tr>
<td>61908</td>
<td>D024756</td>
<td>CYBLE Host</td>
<td>PRoC BLE, PSoC 4 BLE</td>
<td>Component (Tested)</td>
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<td>07-Nov-2014</td>
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<tr>
<td>63199</td>
<td>D025070</td>
<td>BLE Profiles</td>
<td>PRoC BLE, PSoC 4 BLE</td>
<td>Component (Tested)</td>
<td>4.1</td>
<td>17-Dec-2014</td>
</tr>
</tbody>
</table>

Q40. What audio capability does PSoC 4 BLE support?
A: BLE is designed for sensor or control data. BLE is not designed for streaming audio or video. In addition, there is no audio profile over BLE. The audio profile is over Bluetooth Classic. However, Cypress’s BLE solution can support low-fidelity audio for applications such as voice commands. Cypress has a [Remote Control RDK](#) that demonstrates the capability of voice commands.
Q41. Where can I learn more about BLE?
A: These are good starting points:
   Paper: BLE Technology Overview, Sensors, ISSN 1424-8220
   Book: Bluetooth Low Energy: The Developer’s Handbook, by Robin Heydon
   Bluetooth 4.1 Core Specification

Q42. Does PSoC 4 BLE support encryption?
A: Yes. The BLE standard mandates encryption, and PSoC 4 BLE supports 128-bit AES encryption.

Q43. What are the power consumption and battery life of a typical application when using a PSoC 4 BLE based solution?
A: The battery life of a typical BLE application varies based on use cases. A typical touch mouse has a one-year battery life. However, the battery life of a remote control with voice and motion sensor usage would reduce to around six months.
In general, the overall system-level power for a BLE application depends on the time spent in each of the following stages:
   Connected stage: This is where a BLE device is connected to another device. In this mode, two devices exchange data at a pre-defined connection interval. The power usage in this mode depends on the following key parameters:
   Stages A and B: Oscillator startup time, sleep clock accuracy
   Stages C and D: RF transmit and receive
   Stage E: CPU processing time and current for Stack and sensor data processing
   Stage F: Deep-sleep current in which the 32 kHz is active and waits to start the next connection interval
   Standby/Not in use: In this mode, the device is not in use; it will either be in hibernate mode or stop mode.

Figure 1: PSoC 4 BLE Power Consumption
Q44. What transmit power is achievable with PSoC 4 BLE?
A: PSoC 4 BLE provides a programmable transmit power range of +3 dBm to -18 dBm. This is programmable during runtime using APIs. PSoC 4 BLE also supports an external power amplifier. At 0 dBm, PSoC 4 BLE achieves a 10-meter range in an office environment. However, the actual performance depends on factors such as radio frequency interference, physical structures causing signal attenuation, and weather conditions like lightning or fog.

Q45. How do the PSoC 4 BLE low-power modes work?
A: PSoC 4 BLE provides APIs that access the BLE subsystem and Cortex-M0 CPU and allow you to switch between five flexible power modes. Our solution provides example projects that demonstrate these APIs in real applications.

Q46. How does Cypress keep its BLE solution updated with the latest Bluetooth specifications?
A: Cypress periodically offers free, downloadable updates to the PSoC Creator Components. The BLE Component will be maintained with the latest Bluetooth specifications and will be in these software updates.

Q47. Do Cypress’s BLE solutions support Bluetooth 4.2?
A: Cypress’s current BLE solutions support Bluetooth 4.1 and all standard Profiles/Services released by Bluetooth SIG. With PSoC Creator 3.2, Cypress’ BLE solution supports the Internet Protocol Support (IPSP) of Bluetooth 4.2 for IPv6/6LoWPAN feature. The other features of Bluetooth 4.2 will be supported by our future products towards the end of 2015.

Application Types

Q48. What are the target applications for PSoC 4 BLE?
A: PSoC 4 BLE target applications include wearable electronics, sports and fitness monitors, home automation, industrial automation, energy meters and consumer electronics. In general, PSoC 4 BLE is ideal for sensor-based solutions that require low-power wireless connectivity.

Q49. What are the target applications for PRoC BLE?
A: PRoC BLE target applications include human interface devices, such as wireless keyboards, mice, trackpads, toys and remote controls. PRoC BLE also provides a simple, low-cost way to add BLE connectivity to any system. In addition, PRoC BLE supports applications, such as beacons, wireless charging and wireless trackpad.

Q50. Is it possible to do mesh networking over BLE?
A: Yes. This can be implemented using a custom Profile. At present, there is no standard Profile available for mesh networking. An example project for BLE Mesh is
Q51. Can PSoC 4 BLE be a suitable solution for a non-Bluetooth customer?
A: Yes, BLE can be a suitable replacement for other wireless standards such as ZigBee. Customers may want to take advantage of the thriving Bluetooth ecosystem and convert their wireless designs to BLE.

Q52. Which Apple Made for iPod® (MFi) applications can we target with Cypress’s BLE solution?
A: BLE is an ideal replacement for non-audio Apple MFi applications as it eliminates the need for wired hardware. For example, the Oscium MFi oscilloscope is a good candidate for conversion to BLE.

Q53. Does PSoC 4 BLE support motor control?
A: Yes. We are releasing a BLDC Motor Control solution using PSoC 4 in Q2 2015. While we do not extend the support to PSoC 4 BLE, adding this capability can be done using PSoC Creator by migrating the project from a PSoC 4200 device to a PSoC 4200-BL device.

Software/Tools/Drivers

Q54. Does PSoC 4 BLE support Over-The-Air (OTA) firmware upgrades?
A: Yes, PSoC 4 BLE supports OTA firmware upgrades. PSoC Creator 3.1 includes OTA support for the 128KB PSoC 4 BLE and PRoC BLE devices. See the following Component Example Projects:

- BLE_External_Memory_Bootloader (using external flash)
- BLE_External_Memory_Bootloadable (using external flash)
- BLE_Shared_Memory_Bootloader
- BLE_Shared_Memory_Bootloadable

The OTA support for 256KB PSoC 4 BLE and PRoC BLE devices will be released with PSoC Creator 3.2 SP1 in Q3 2015. We plan to offer full application + Stack OTA, and application-only OTA.

There are four options for OTA upgrade:
1. Use an external EEPROM (both application code and Stack could be upgraded)
2. Overwrite the application code (Stack remains the same)
3. Link to multiple application code spaces and overwrite one of them (Stack remains the same)
4. Use the 256KB flash version of the PSoC 4 BLE / PRoC BLE device (Both the application code and the Stack could be upgraded depending upon the available free space)
Q55. What development tools are available for PSoC 4 BLE?
A: PSoC Creator Integrated Design Environment (IDE). No other development tool is required.

Q56. What is PSoC Creator?
A: PSoC 3, PSoC 4, PSoC 5LP, PRoC BLE Integrated Design Environment (IDE) Software that installs on your PC and allows:
• Concurrent hardware and firmware design of PSoC systems, or
• Hardware design followed by export to popular IDEs

Q57. Does Cypress provide the BLE Protocol Stack?
A: Yes, Cypress provides a royalty-free Stack compatible with Bluetooth 4.1. The Stack is provided as a library, without the source code, in PSoC Creator.

Q58. Does Cypress provide source code for BLE Profiles?
A: Yes, Cypress provides a GUI representation of the entire protocol Stack, which generates source code for a selected profile.

Q59. Does Cypress provide any test utilities?
A: PSoC Creator has a utility called CySmart which provides a host emulation software platform to test and debug BLE peripheral or sensor applications via an easy-to-use graphical user interface (GUI). CySmart will be available as an independent software application and will also have the capability to be launched from the PSoC Creator. This tool will work with the BLE USB dongle provided with all BLE kits.

Q60. How do you configure CapSense operation?
A: The CapSense Component in PSoC Creator has a GUI-based configuration tool, which enables you to configure user-defined combinations of buttons, sliders, touchpads and proximity capacitive sensors.

Q61. Does Cypress’s BLE solution include any example mobile apps?
A: Yes, the BLE Pioneer kit ships with example mobile apps for the iOS and Android operating systems. The example mobile apps ship with full source code.

Q62. Which operating systems (Oss) does PSoC 4 BLE support?
A: PSoC 4 BLE works with all major operating systems that natively support BLE, including Windows, iOS, OS X and Android.

Q63. How is the BLE Protocol Stack configured with Cypress’s BLE solution?
A: The BLE Component in PSoC Creator is used to configure the BLE Protocol Stack in a simple GUI-driven Component Configuration Tool.
Q64. How are BLE Profiles configured with Cypress’s BLE solution?
A: The BLE Component in PSoC Creator is used to configure the BLE Profile in a simple, GUI-driven Component Configuration Tool.

Q65. Where can I get the CySmart mobile apps for Android or iOS?
A: You can download the CySmart mobile apps free of charge from the respective app stores for Android and iOS. To request the source code for the mobile apps, please create a Tech Support service case on cypress.com (MyCases).

CySmart for iOS:

CySmart for Android:

CySmart Mobile Apps reference on cypress.com:
www.cypress.com/CySmartMobile

Hardware/Modules/Kits

Q66. Does Cypress provide reference schematics to help customers understand application circuit design using PSoC 4 BLE?
A: Yes, the PSoC 4 BLE datasheet includes an overview of the reference application schematics. In addition, we provide full design files for our development kits, including reference schematics and Gerber files.

Q67. Which reference development kits (RDKs) are available for PSoC 4 BLE and PRoC BLE?
A: The PSoC 4 BLE solutions do not have any RDKs; however the BLE Pioneer kit contains FCC-certified BLE modules and an Arduino-compatible baseboard. The PRoC BLE solution includes two RDKs: a BLE Touch Mouse and a BLE Remote Control. In addition, the kit installer file (zip file) will be available on the kit website, which will include all of the design files, schematics, application firmware and example projects.

Q68. Will Cypress provide production-ready, high-volume, FCC-certified BLE modules?
A: Yes. Cypress provides an FCC-certified BLE module, called the EZ-BLE PRoC Module (MPN: CYBLE-022001-00). This cost-competitive, small-form-factor BLE module supports high-volume production. The module is fully SIG-qualified, and complies with RF regulatory standards such as FCC and CE, making the module plug-and-play for customers. The module’s spec’s include:
• Bluetooth SIG and Certified QD ID
• FCC, CE, KC, TELEC, and IC compliance-certified
• Small footprint – 10 mm x 10 mm x 1.8 mm, 21-pad LGA package
• All required components on-board (two crystals, chip antenna, passives, shield)
• Adapter board interface to the BLE Pioneer Kit
• Access to SWD for programming
• Access to ~14 GPIOs including Serial, CapSense, Analog

Q69. What is included with the BLE Pioneer Kit (CY8CKIT-042-BLE)?
A: The BLE Pioneer Kit includes the following:
   • BLE Pioneer baseboard
   • FCC-certified PSoC 4 BLE development module
   • FCC-certified PRoC BLE development module
   • BLE USB dongle
   • PSoC Creator example projects
   • Example mobile apps for iOS and Android operating systems

Q70. Can the BLE development modules be purchased separately from the development kit?
A: Yes, the PSoC 4 BLE and PRoC BLE modules can be purchased separately. The MPNs for these modules are:
   • CY8CKIT-142 PSoC 4 BLE Module (128KB)
   • CY8CKIT-143 PSoC 4 BLE Module (256KB)
   • CY8CKIT-141 PSoC 4 BLE SMA Module (128KB)
   • CY5671 PRoC BLE Module (128KB)
   • CY5676 PRoC BLE Module (256KB)
   • CY5674 PRoC BLE SMA Module (128KB)

Q71. Does the BLE Pioneer Kit support both PSoC 4 BLE and PRoC BLE solutions?
A: Yes, the BLE Pioneer Kit supports both PSoC 4 BLE and PRoC BLE solutions and ships with a module for each.

Q72. What function does the included BLE USB Dongle serve in the kit?
A: The included BLE USB Dongle is intended as a BLE host device that enables communication with the PSoC 4 BLE or PRoC BLE modules. The BLE USB Dongle converts any Windows-based laptop with a USB port into a BLE host device.

Competition/Positioning

Q73. How does PSoC 4 BLE compare with the incumbents: Nordic, TI, CSR and Dialog?
A: Here is the marketing blacklist for PRoC BLE vs. the competition:
1. **Faster ARM core**: Nordic’s solution has a 32-bit ARM Cortex-M0 CPU at 16 MHz, whereas TI offers only an 8-bit 8051 CPU; Cypress provides an ARM Cortex-M0 at 48 MHz. Faster processing enables the CPU to spend more time in sleep modes, reducing system power consumption while enabling applications with higher processing requirements.

2. **Integrated Programmable Peripherals**: PSoC 4 BLE integrates many more peripherals than other solutions do, including programmable analog front ends, programmable digital logic, CapSense and LCD drive, enabling customers to design one-chip, sensor-based BLE solutions.

3. **Integrated CapSense**: Cypress’s solution integrates CapSense with two-finger gestures, enabling a single-chip solution for UI applications. No competitor supports CapSense.

4. **Flexible Serial Interfaces**: Nordic and CSR do not support a slave mode for I²C or SPI. Therefore, their solutions cannot be used as peripheral ICs. Cypress’s solution provides up to four SPI master/slaves, two I²C master/slaves and four UARTs for easy interoperability with many ICs.

5. **Integrated Balun**: Nordic and TI’s solutions require an external Balun; Cypress integrates the Balun and needs only two external RF components, compared to seven to nine external components for competitors’ solutions. Reduced component count simplifies the RF board design for an Antenna Matching Network.

6. **Integrated Tuning Capacitor**: Nordic and TI’s solutions require two external load capacitors for a 24-MHz crystal oscillator. Cypress integrates the load capacitors.

7. **Flexible Low-Power Modes**: The lowest power mode (when not in use) consumption is Nordic at 2.3 µA. TI’s solution is 500 nA and CSR’s solution is 600 nA. Cypress has the best-in-class low-power modes: Stop mode at 60 nA, Hibernate mode at 150 nA and Deep-Sleep mode at 1.3 µA. These power modes enable lower system power consumption because BLE applications are in sleep mode most of the time.

8. **Superior Design Environment**: TI’s development environment is based on IAR, which requires a licensing fee. Nordic’s development environment is complex; it requires different tools for application development, Stack and emulator. Cypress’s PSoC Creator is a free, fully integrated IDE. PSoC Creator also provides options to export designs to third-party IDEs, such as Keil, IAR and Eclipse.

9. **GUI-based Protocol Stack**: Using the BLE Protocol Stack in all of the competitive solutions requires an understanding of many APIs and layers. Cypress provides a GUI-based BLE Protocol Stack configuration and APIs for easy firmware development.

10. **Flash-based Solution**: CSR’s solution is ROM-based, which requires external flash. Cypress’s solution is flash-based for both the application code and the BLE Stack code.
Q74. How does PSoC 4 BLE’s RF interference rejection compare to the competitors?
A: PSoC 4 BLE has a very good RF adjacent Channel Interference (CI) rejection, which enables robust link and range (10 meters in an office environment). The following table provides the PSoC 4 BLE CI vs. the competition:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cypress</th>
<th>TI</th>
<th>Nordic</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Adjacent CI Wanted Signal at -67dBm and Interferer at FRX ±1 MHz</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>dB</td>
</tr>
<tr>
<td>Adjacent CI Wanted Signal at -67dBm and Interferer at FRX ±2 MHz</td>
<td>-29</td>
<td>-26</td>
<td>-25</td>
<td>dB</td>
</tr>
<tr>
<td>Adjacent CI Wanted Signal at -67dBm and Interferer at ≥ FRX ±3 MHz</td>
<td>-39</td>
<td>-34</td>
<td>-51</td>
<td>dB</td>
</tr>
</tbody>
</table>

Q75. Is BLE power consumption better than proprietary 2.4 GHz?
A: Not typically. The key reason is that a dongle in the proprietary 2.4 GHz is always on, thereby allowing a quick connection from the peripheral side. In the case of BLE, PCs and smartphones scan at their own duty cycle, creating a buffer of multiple packets to transfer before a connection can be established.

Portfolio/Roadmap

Q76. What other products are available in Cypress’s wireless portfolio?
A: Cypress provides a complete range of wireless products; please refer to the Wireless/RF roadmap for further details.

Q77. What other products are available in Cypress’s PSoC portfolio?
A: Cypress provides a complete range of programmable SoCs; please refer to the PSoC Roadmap for further details.

Q78. Is PSoC 4 BLE compatible with any Cypress proprietary wireless products?
A: No. PSoC 4 BLE is a BLE-only solution.

Q79. A remote control application requires custom logic. Is this an opportunity for PRoC BLE or for PSoC 4 BLE?
A: PRoC BLE, because it is a remote control opportunity. This may require a custom (CG) part number. Please contact sales@cypress.com.
Q80. I have a wearable customer who needs a sensor hub leveraging our analog and CapSense functionality. Which solution should we choose?
A: PSoC 4 BLE. Its high integration of analog blocks is ideal for this opportunity.

Support

Q81. When will PSoC 4 BLE be available?
A: PSoC 4 BLE 128KB Flash variant is in product now. PSoC 4 BLE 256KB variant will sample in Q315 with full production in Q415.
All of the development kits, software and silicon samples will be available at sampling.

Q82. What support can CY provide for customers unfamiliar with wireless designs?
A: Cypress provides customer support in the following forms:
- Reference schematics, layout design guidelines and reference firmware for typical wireless HID applications
- “Copy-exact” PCB antenna board layout files
- Customer schematics and layout review to reduce design cycle time
- Schematics, layout and firmware for customers to manufacture low-cost manufacturing test kits
- Cypress Design Services, certified CYPros and consultant references

Q83. What app notes are available for the PSoC 4 BLE solution?
A:

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>AN91267: Getting Started with PSoC 4 BLE</td>
</tr>
<tr>
<td>2</td>
<td>AN95089: PSoC 4 BLE / PRoC BLE Crystal Oscillator Selection and Tuning Techniques</td>
</tr>
<tr>
<td>3</td>
<td>AN92584: Designing for Low Power and Estimating Battery Life for BLE Applications</td>
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<tr>
<td>4</td>
<td>AN91184: PSoC 4 BLE Designing BLE Applications</td>
</tr>
<tr>
<td>5</td>
<td>AN91162: Creating a BLE Custom Profile</td>
</tr>
<tr>
<td>6</td>
<td>AN86233: Low-Power Modes and Power Reduction Techniques</td>
</tr>
<tr>
<td>7</td>
<td>AN84858: PSoC® 4 Programming Using an External Microcontroller (HSSP)</td>
</tr>
<tr>
<td>8</td>
<td>AN57821: PSoC® 3, PSoC 4, and PSoC 5LP Mixed-Signal Circuit Board Layout Considerations</td>
</tr>
<tr>
<td>9</td>
<td>AN87391: PSoC® 4 Segment LCD Direct Drive</td>
</tr>
<tr>
<td>10</td>
<td>AN54460: PSoC® 3, PSoC 4, and PSoC 5LP Interrupts</td>
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<tr>
<td>11</td>
<td>AN86526: PSoC® 4 I2C Bootloader</td>
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<tr>
<td>12</td>
<td>AN68272: PSoC® 3, PSoC 4 and PSoC 5LP UART Bootloader</td>
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Design Guides

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<thead>
<tr>
<th>#</th>
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<tbody>
<tr>
<td>1</td>
<td>PSoC 4 BLE / PRoC BLE Antenna Design Guide</td>
</tr>
<tr>
<td>2</td>
<td>PSoC 4 CapSense Design Guide</td>
</tr>
<tr>
<td>Rev.</td>
<td>ECN No.</td>
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</table>
| *A   | 4601739 | CCEP           | Q13: Removed 500ppm xtal recommendation  
Q36: Expanded QIID qualification section with more details, added list of CY UDIDs  
Q49: Updated OTA details  
Q54: Added CySmart for Windows download link  
Q56: Added CySmart for iOS/Android mobile appstore links  
Q62: Updated production module availability to Q115  
All links are updated  
Dates are updated |
| *B   | 4650608 | GUL            | Added Q35. Can Cypress’s BLE devices operate in both GAP Central and GAP Peripheral modes?  
Added Q47. Does Cypress’s BLE solution support Bluetooth 4.2?  
Added Q53. Does PSoC 4 BLE support motor control?  
Updated Q54. Does PSoC 4 BLE support Over-the-Air (OTA) firmware upgrades?  
Added Q65. Where can I download the CySmart mobile apps for Android or iOS?  
Updated Q68. Will Cypress provide production-ready, high-volume, FCC-certified BLE modules?  
Fixed numbering |
| *C   | 4683877 | RWEI           | Updated the following questions with BLE256 features:  
1) Q2. What is PSoC 4 BLE? What are its key features?  
2) Q4. What is PRoC BLE? What are its key features?  
3) Q6. How much memory does the PSoC 4 BLE Stack consume?  
4) Q11. Is PSoC 4 BLE available in small packages for wearable applications?  
5) Q12. Is this product available in the industrial temperature grade "I"?  
6) Q47. Do Cypress’s BLE solutions support Bluetooth 4.2? |
<p>| *D   | 4796401 | GUL            | Q39.3: Added QDID for BLE Profiles |</p>
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<tr>
<th>Rev.</th>
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<th>Orig. of Change</th>
<th>Description of Change</th>
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<tr>
<td></td>
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<td>Q44: Fixed Power number from -20 dBm to -18 dBm</td>
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<tr>
<td></td>
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<td></td>
<td>Q47: Added information on Bluetooth 4.2 and IPSP Profile</td>
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<td></td>
<td>Q68: Updated EZ-BLE PRoC Module information</td>
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<td>Q70: Updated dev kit modules information, including 256kb</td>
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