Cypress PSoC® 6 Microcontrollers

Purpose-Built for the Internet of Things

WWW.CYPRESS.COM/PSOC6
INCREASING DEMANDS FOR THE INTERNET OF THINGS

The IoT is exploding, with more than 30 billion devices projected to be in service by 2020. At the heart of every IoT device lies a mixed-signal embedded system that is taking on an increased amount of data processing, fueled by cloud connectivity. Devices such as door locks, factory machinery, and wearables are becoming smart — sensing, connecting, learning and responding — to make life easier. With connectivity, security becomes critical to protect users from malicious activity. These next-generation IoT devices require increased processing and security without incurring power and cost penalties.

Increased Data Processing
Today’s IoT devices are collecting and processing more data than ever. Even wearable devices can contain more than a dozen sensors, including biometric, environmental, and motion sensors. Sensor data is collected and processed in real-time requiring a processor capable of sensor aggregation.

Flexible Connectivity
IoT devices connect to the cloud via various wired and wireless protocols including USB, Bluetooth Low Energy (BLE), Wi-Fi, and LPWAN. Having the flexibility to connect via different connectivity options is essential.
Extended Battery Life

From wearables to remote sensors, more and more IoT devices are running on batteries. Extending the time between battery charges is a key requirement for battery-powered IoT devices.

Security

Security and privacy are significant IoT concerns. Users must be confident that their personal data is always protected while their IoT devices are connected to the Internet. Similarly, IoT developers must be able to ensure the authenticity of their products to eliminate counterfeits and perform secure over-the-air updates to keep their products current.
PSOC® 6 MICROCONTROLLERS
Purpose-Built for the Internet of Things

Cypress’ PSoC 6 MCU architecture is purpose-built for the IoT, filling the gap between expensive, power-hungry applications processors and low-performance MCUs. The ultra-low power PSoC 6 MCU architecture offers the processing performance needed by IoT devices. Security is built-in, enabling a single-chip solution. PSoC 6 enables engineers to uniquely create innovative, next-generation IoT devices leveraging the unique PSoC fabric with its easy-to-use, software-defined peripherals.

LOWEST POWER
IoT devices are often portable, making battery life a critical factor. The PSoC 6 MCU architecture is built on a cutting-edge, ultra-low-power, 40-nm process technology with a dual Arm® Cortex®-M core architecture. Active power consumption is as low as 22-μA/MHz for the M4 core, and 15-μA/MHz for the M0+ core. PSoC 6 delivers extended battery life without sacrificing performance.

MOST FLEXIBILITY
The rapid growth of the IoT is sparking a need for innovation in IoT products. The PSoC 6 MCU architecture’s best-in-class flexibility enables the addition of new features, and addresses the need for unique IoT products with multiple connectivity options, such as USB and BLE. PSoC 6 also offers software-defined peripherals to create custom analog and digital circuits, and the industry’s best capacitive-sensing solution, CapSense®. In addition, a flexible dual-core architecture is used to optimize for system power consumption and performance. The possibilities are endless.

BUILT-IN SECURITY
With a growing number of devices connecting to the IoT, security must be established between hardware, cloud applications, and servers, and finally users and services. The PSoC 6 MCU architecture supports multiple, simultaneous secure environments without the need for external memories or secure elements, and offers scalable secure memory for multiple, independent user-defined security policies, preventing your IoT device from becoming a security liability. PSoC 6 provides you with a new standard for IoT security.
UNMATCHED SOLUTIONS FOR THE INTERNET OF THINGS

The Oura Ring

The Oura Ring is the world’s most-advanced wearable that helps you achieve restorative sleep. This innovation is delivered through PSoC 6 MCUs, enabling the following features:

SMALL FORM FACTOR
Integration of several functions into a single PSoC 6 MCU helped reduce the size of the ring over the prior generation by 50%.

DATA STORAGE
PSoC 6’s on-chip flash memory enables storage of up to six weeks of user data.

BLUETOOTH LOW ENERGY
The built-in BLE wireless connectivity in PSoC 6 provides communication to the mobile app device.

EXTENDED BATTERY LIFE
PSoC 6’s ultra-low power was able to extend battery life to seven days, 3X longer than the prior generation ring.

SENSOR FUSION
PSoC 6, as the host processor, connects different biometric sensors in the ring to collect and process data.

DATA PROCESSING
The dual Cortex-M4 and Cortex-M0+ cores in PSoC 6 enabled 10X more processing capability vs. the prior-generation ring.

“The Oura ring required long-lasting battery life, increased processing capacity, and the use of advanced sensors, all in a stylish and comfortable form factor. Choosing Cypress as our partner helped us meet these requirements and redefine what is possible for wearable health products.”

Petteri Lahtela
CEO and Co-founder at Oura Health

For more information on the Oura Ring, please visit: www.ouraring.com
WEARABLE EXAMPLE

Modern wearables incorporate a growing number of functions and capabilities while maximizing battery life. Functions such as sleek user interfaces with sliders and proximity sensors, voice command support, seamless BLE connectivity, display driving, and process-intensive sensor aggregation can all be achieved in a single PSoC 6 MCU without sacrificing battery life.
LOW POWER

PSoC 6 was designed for ultra-low power consumption. Starting with the dual-core architecture, the Cortex-M4 core can be put to sleep to conserve power, while monitoring functions can be managed by the Cortex-M0+ core. Dynamic voltage and frequency scaling can be controlled by the user to optimize power for different operating environments. With multiple sleep and hibernate modes, users can fine-tune their power profiles.

BUILT-IN SECURITY

PSoC 6 is designed to provide a hardware-based root of trust for secure applications. A hardware-based root of trust provides extra protection against unauthorized access to keys. In addition, hardware accelerated cryptography and true random-number generation are provided, which are needed for secure boot, authentication, secure over-the-air updates and other functions.

CONNECTIVITY

PSoC 6 supports multiple wired and wireless connectivity options including Bluetooth Low Energy, Wi-Fi, and USB.

CAPSENSE

PSoC 6 leverages Cypress’ industry-leading CapSense solution for capacitive sensing with state-of-the-art noise immunity and water rejection used for applications including touch buttons and sliders, proximity detection and liquid-level sensing.

SOFTWARE-DEFINED PERIPHERALS

Cypress’ software-defined peripherals can be configured using pre-built library functions or customized using the programmable architecture inside of PSoC 6 devices:

Programmable analog blocks are composed of an assortment of opamps, comparators, ADCs, and DACs, enabling complex analog signal flows.

Programmable digital blocks are composed of Universal Digital Blocks (UDBs), Serial Communication Blocks (SCBs), and Timer / Counter / Pulse Width Modulators (TCPWMs). These blocks can be configured to set-up custom digital interfaces, state machines, and custom logic functions.

VIDEO DOORBELL EXAMPLE

For a smart home application like a video doorbell, PSoC 6, with its dual Cortex-M4 and Cortex-M0+ cores, can transmit real-time video as well as incorporate proximity detection, capture and play audio, and interface to a Cypress fingerprint sensor module or Cypress WICED Wi-Fi chipset. The PSoC 6 MCU’s ultra-low-power profile enables smart applications to run off batteries.
ModusToolbox™ Software Environment

ModusToolbox simplifies development for IoT designers, delivering easy-to-use tools and a familiar IDE, with support for Windows®, macOS®, and Linux. It provides a powerful suite of tools for system and peripheral set-up. Code examples, documentation, RTOS and Cloud service support, and technical support forums are available to help your IoT development process along.

Graphical Configuration Tools:
GUI-based configuration tools used to configure peripherals such as Smart I/O, CapSense, and wireless connectivity to quickly design and develop IoT systems.

To start designing with the ModusToolbox Software Environment, please visit www.cypress.com/ModusToolbox
PSOC 6 DEVELOPMENT KITS

Cypress offers award winning development kits along with hundreds of code examples allowing you to evaluate, prototype and debug designs with PSoC 6. The PSoC 6 development kits are pin-compatible with various 3rd party expansion boards including Arduino™ shield boards and Digilent® Pmod™ daughter cards.

PSOC 6 WI-FI BT PROTOTYPING KIT (CY8CPROTO-062-4343W)

PSOC 6 BLE PROTOTYPING KIT (CY8CPROTO-063-BLE)

PSOC 6 WIFI-BT PIONEER KIT (CY8CKIT-062-WIFI-BT)

PSOC 6 BLE PIONEER KIT (CY8CKIT-062-BLE)

For more information on PSoC 6 kits, go to: http://www.cypress.com/microcontrollers-mcus-kits
What’s your next game-changing application?

**Graphic Display**

Incorporate a slick graphics display to your next IoT application with the use of the Universal Digital Blocks (programmable logic).

**Audio Processing**

Add an audio subsystem with an I2S interface and two Pulse Density Modulation (PDM) channels.

**Sensor Fusion**

Interface to analog sensors with the programmable analog block functions of PSoC 6, which includes op-amps, comparators, and a 12-bit SAR ADC. Digital sensors can easily be connected via the Serial Communication Blocks (SCBs).

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**MCU Subsystem**

- **arm Cortex-M4** with SP FPU
  - 150-MHz
  - I-Cache 8KB

- **arm Cortex-M0+**
  - 100-MHz
  - I-Cache 8KB
  - SRAM Up to 1MB
  - Flash: Up to 2MB
  - CRYPTO
  - DMA X2
  - eFUSE
  - RTC
Incorporate a slick graphics display to your next two Pulse Density Modulation (PDM) channels. Add an audio subsystem with an I2S interface and Serial Communication Blocks (SCBs).

Digital sensors can easily be connected via the analog block functions of PSoC 6, which includes Interface to analog sensors with the programmable Microphone.

Digital Blocks (programmable logic).

Analog Blocks
- Opamp x2
- CMP x2
- 12-bit DAC
- 12-bit SAR ADC
- CapSense

Digital Blocks
- UDB x12
- TCPWM x32

Communication Interfaces
- SCB x8
- I²S PDM-PCM
- Deep Sleep SCB
- SMIF (Quad-SPI)

Bluetooth Smart Connectivity
- BLE 5.0 Link Layer
- 2.4-GHz RF Transceiver

I/O Subsystem
- GPIO x6
- GPIO x6
- GPIO x6
- GPIO x6
- GPIO x6
- GPIO x6
- GPIO x8
- GPIO x8
- GPIO x8
- GPIO x8

Programmable Interconnect and Routing

Human Machine Interface

Replace traditional buttons with touch, add touch sliders, or add proximity detection with Cypress’ CapSense technology. Use the TCPWM to drive motors, actuators or LEDs.

Interface Bridging and Port Expansion

Serial Communication Blocks (SCBs) can be configured to support serial interfaces such as UART, I²C and SPI. USB 2.0 host and device support is available with PSoC 6.

Wireless Connectivity

Add Bluetooth Low Energy connectivity with built-in BLE radio and sub-system. Add Wi-Fi or Bluetooth with Cypress’ WICED portfolio.
ABOUT CYPRESS
Cypress is the leader in advanced embedded system solutions for the world’s most-innovative automotive, industrial, home automation and appliances, consumer electronics and medical products. Cypress’ programmable and general-purpose microcontrollers, analog ICs, wireless and USB-based connectivity solutions and reliable, high-performance memories help engineers design differentiated products and get them to market first. To learn more, go to www.cypress.com.