Cypress PSoC® 4 Microcontrollers

Your Problem-Solver on Chip

WWW.CYPRESS.COM/PSoC4

THE DIFFERENTIATION DILEMMA

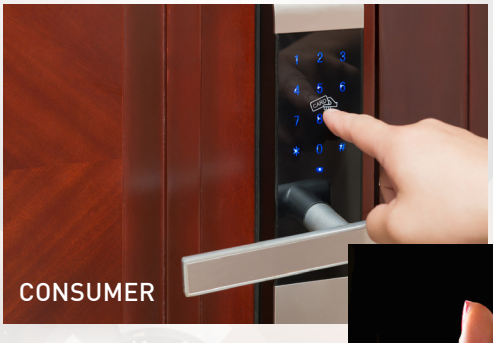
Embedded systems are rapidly advancing with innovative features added at each new product generation. Your competition is not standing still, so why should you? They key to rising above the noise in a crowded market is differentiation, and here are three ways to help your products stand out:

MAKE IT SMARTER

Embedded systems use sensors to collect information about the world around them and use that data to learn and make more intelligent decisions.

MAKE IT EASY TO USE

Enhanced user interfaces, such as touch and graphic displays, can improve the user experience. They also replace bulky buttons with sleek and cool designs.



MAKE IT CONNECT

Wireless connectivity such as Bluetooth® Low Energy can connect your application to a smartphone app and to the cloud, enabling features such as remote control, data analytics, and over-the-air updates.

PSoC 4 MICROCONTROLLERS

Your Problem Solver on Chip

PSoC 4 has tackled some of the complex portions of embedded system design making it easier for you to get your product to market. Functions such as analog sensor integration, capacitive touch, and wireless connectivity have been integrated and optimized in PSoC 4 to "just work" so you don't have to.

ANALOG SENSOR INTEGRATION TO MAKE YOUR APPLICATION SMARTER

PSoC 4 allows you to customize your own analog front end to interface to any analog sensor with programmable analog blocks such as opamps, comparators, ADC and DACs. PSoC 4 can also eliminate the need for external analog components, saving you time and money.

CAPACITIVE TOUCH TO MAKE YOUR APPLICATION EASY TO USE

You can improve the usability and sleekness of your product by adding features such as capacitive touch buttons and sliders, proximity detection, and liquid-level sensing. Cypress' CapSense® solution in PSoC 4 devices is the industry's leading capacitive-sensing solution with state-of-the-art noise immunity and water rejection.

WIRELESS CONNECTIVITY TO CONNECT YOUR APPLICATION

Bluetooth Low Energy (BLE) is built into PSoC 4 and includes all BLE profiles and APIs for easy deployment. With an integrated balun for antenna matching, PSoC 4 BLE simplifies RF board design and reduces PCB footprint. With example projects and development kits, you can get BLE connectivity up and running in a matter of minutes.

PSoC 4 DELIVERS ULTIMATE MIXED-SIGNAL FLEXIBILITY

Achieve ultimate flexibility in your design with Cypress' software-defined peripherals embedded in the PSoC 4 architecture. Configure these peripherals using pre-built library functions or create your own using the programmable architecture inside of PSoC 4 devices:

CAPACITIVE SENSING

Cypress' CapSense is the industry-leading capacitive-sensing solution for touch, proximity sensing, and liquid-level sensing applications. CapSense is a dedicated peripheral found across the entire PSoC 4 portfolio.

PROGRAMMABLE ANALOG BLOCKS

Customize your analog front end to interface to any analog sensor through programmable analog blocks, which are composed of an assortment of opamps, comparators, ADCs, and DACs, enabling complex analog signal flows.

SMART I/O

The Smart I/O block is a fabric of switches and LUTs that allows Boolean functions to be performed in signals being routed to the pins of a GPIO port. The Smart I/O can perform logical operations on input pins to the chip and on signals going out as outputs.

UNIVERSAL DIGITAL BLOCKS (UDB)

Programmable digital blocks that can be configured as timing-critical coprocessors that simplify firmware and ISR handling by replacing "bit-banging" firmware.

SEGMENT LCD DRIVE

PSoC 4 uses full digital methods to drive LCD segments requiring no generation of internal LCD voltages.

INDUCTIVE SENSING

MagSense™ is Cypress' reliable contact-less metal-sensing for applications such as buttons (touch-over-metal), proximity detection and measurement, rotary and linear encoders, spring based position detection and other applications.

SERIAL COMMUNICATION BLOCKS (SCB)

Can be configured as serial communication interfaces like I^2C, UART, SPI, or LIN.

WIRED AND WIRELESS CONNECTIVITY

Wired connectivity interfaces, such as CAN and USB, are available in the PSoC 4 portfolio. For wireless connectivity, Bluetooth Low Energy is also available.

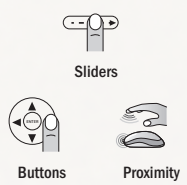
T/C/PWM

Blocks that can be configured as timers, counters, pulse-width modulators or quadrature decoders.

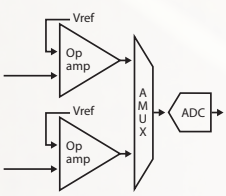
PSoC 4 PORTFOLIO

The PSoC 4 portfolio consists of several families of Arm® Cortex®-M0 and Cortex-M0+ microcontrollers. Most devices in the portfolio include Cypress' CapSense technology for capacitive-sensing applications. Other key features in the PSoC 4 portfolio include a customizable analog front end through programmable analog blocks, programmable digital blocks as well as wired and wireless connectivity options such as USB, CAN, and Bluetooth Low Energy. These unique features make PSoC 4 the industry's most-flexible and scalable low-power mixed-signal architecture.

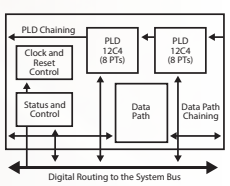
ENTRY LEVEL	INTELLIGENT ANALOG	PROGRAMMABLE DIGITAL	MOTOR AND POWER CONTROL	SENSE ANYTHING
PSoC® 4000 Family	PSoC® 4100 Family	PSoC® 4200 Family	PSoC® 4500 Family	PSoC® 4700 Family
CapSense	CapSense + Programmable Analog Blocks	CapSense + Programmable Analog Blocks + Programmable Digital Blocks	CapSense + Dual ADCs + Computational Accelerators	CapSense + MagSense + Programmable Analog Blocks + Advanced Sensing Technologies



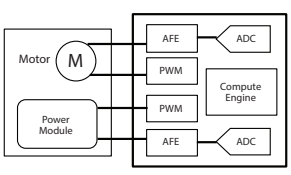
Capacitive Sensing



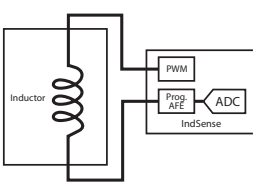
Programmable Analog Front End



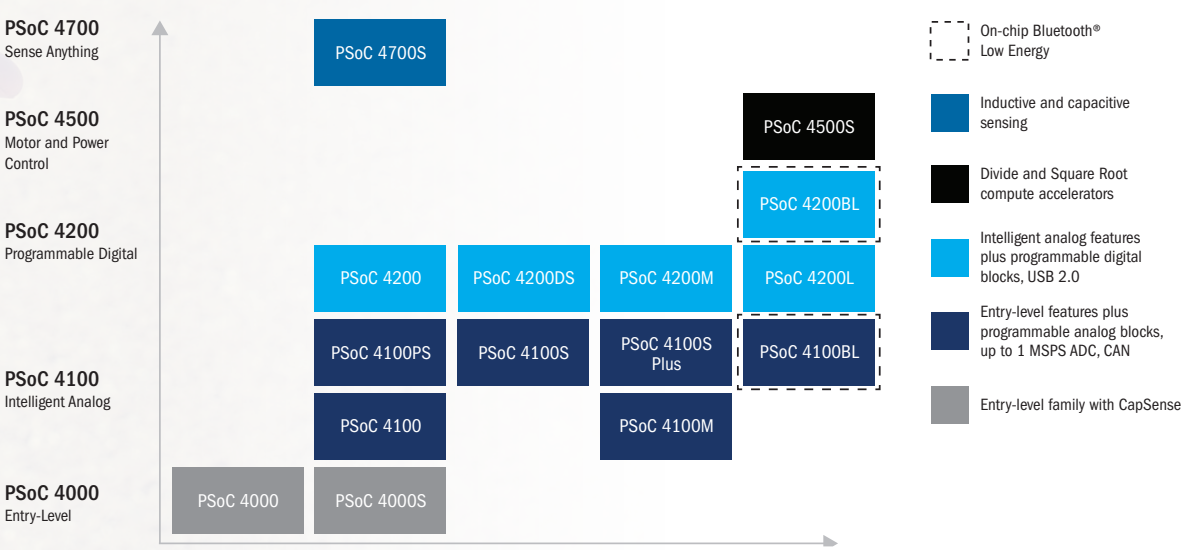
Universal Digital Block



Motor control and Power Conversion



Inductive Sensing Technology

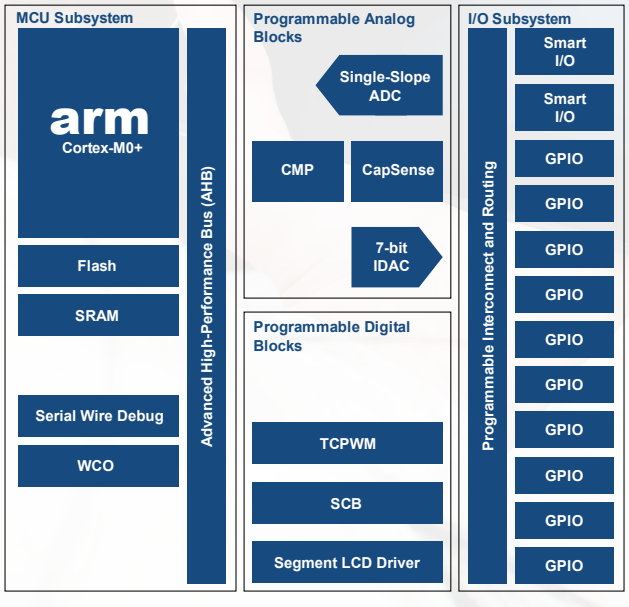


PSoC 4000 FAMILY

Entry-Level Family

The PSoC 4000 family is a cost-optimized, entry-level family of microcontrollers. The PSoC 4000 family delivers the industry's best capacitive-sensing technology, CapSense, to implement buttons, sliders, and proximity sensors.

PSoC 4000 FAMILY SERIES BLOCK DIAGRAM



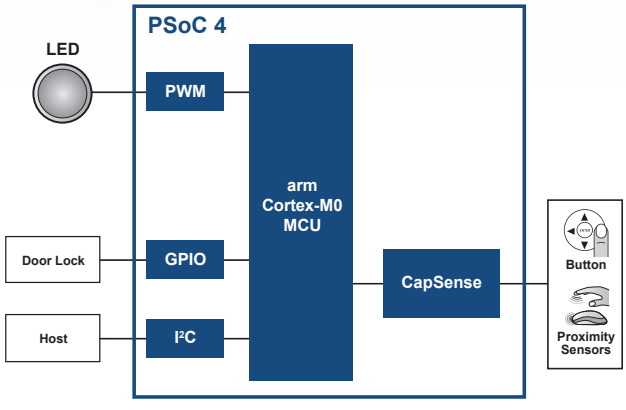
PSoC 4000 FAMILY FEATURES AT A GLANCE

	PSoC 4000	PSoC 4000S
Max CPU Speed	16 MHz	48 MHz
Flash (KB)	8 - 16	16 - 32
SRAM (KB)	2	2 - 4
ADC	10-bit 58 sps Del-Sig	10-bit 11.6 Ksps Single-Slope
Comparators	1	2
Timers / Counters / PWMs	1	5
Serial Interfaces (I²C/SPI/UART)	1 (I²C)	2
CapSense Blocks	1	1
Max GPIO	20	36
Packages	28-pin SSOP 24-pin QFN 16-pin QFN 16-pin SOIC 8-pin SOIC 16-ball WLCSP	48-pin TQFP 40-pin QFN 32-pin TQFP 32-pin QFN 24-pin QFN 25-ball WLCSP

APPLICATION EXAMPLE: COFFEE MACHINE

PSoC Enables:

- Liquid-tolerant capacitive touch interface for buttons and sliders
- Proximity detection
- LED control
- Door lock control

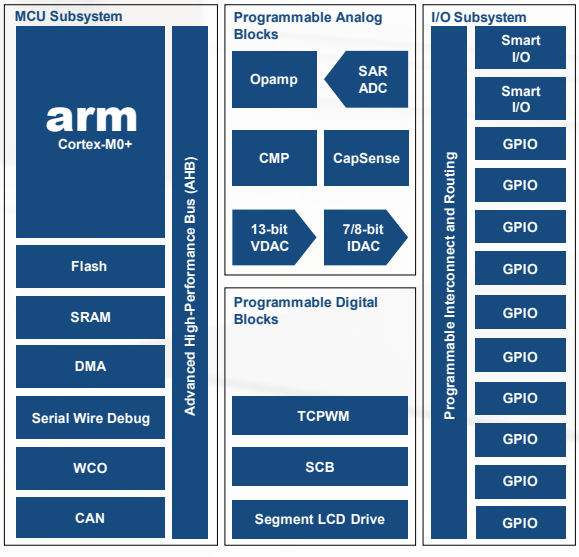


PSoC 4100 FAMILY

Intelligent Analog Family

The PSoC 4100 family adds intelligent analog integration through programmable analog blocks. Programmable analog blocks include analog-to-digital converters (ADCs), digital-to-analog converters (DACs), low-power comparators, and operational amplifiers (opamps). The PSoC 4100BL includes an integrated Bluetooth Low Energy radio and subsystem.

PSoC 4100 FAMILY BLOCK DIAGRAM



PSoC 4100 FEATURES AT A GLANCE

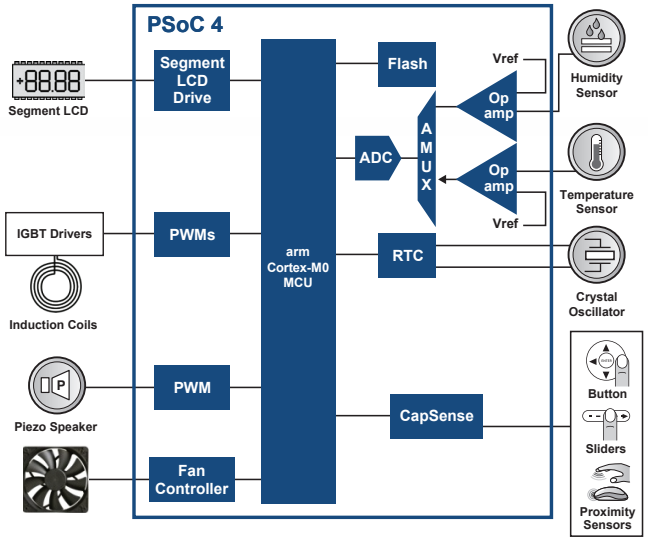
	PSoC 4100	PSoC 4100S	PSoC 4100PS	PSoC 4100S Plus	PSoC 4100M	PSoC 4100BL
Max CPU Speed	24 MHz	48 MHz	48 MHz	48 MHz	24 MHz	24 MHz
Flash (KB)	16 - 32	16 - 64	16 - 32	32 - 256	32 - 128	128 - 256
SRAM (KB)	4	4 - 8	4	16 -32	4 - 16	16 - 32
ADC	12-bit 806 Ksps SAR	12-bit 1Msps SAR	12-bit 1Msps SAR	12-bit Msps SAR	12-bit 806 Ksps SAR	12-bit 806 Ksps SAR
VDAC	0	0	2	0	0	0
Opamps	2	2	4	2	4	2
Comparators*	4	4	6	4	6	4
Timers / Counters / PWMs	4	5	8	8	8	4
Serial Interfaces (I^2C/SPI/ UART)	2	3	3	5	4	2
CapSense Blocks	1	1	1	1	1	1
CAN Controller	0	0	0	1	0	0
BLE	No	No	No	No	No	4.1 / 4.2
Max GPIO	36	36	38	54	55	36
Packages	48-pin TQFP 44-pin TQFP 40-pin QFN 28-pin SSOP 35-ball WLCSP	48-pin TQFP 44-pin TQFP 40-pin QFN 32-pin QFN 35-ball WLCSP	48-pin TQFP 48-pin QFN 45-ball WLCSP 28-pin SSOP	64-pin TQFP 48-pin TQFP 44-pin TQFP	68-pin QFN 64-pin TQFP 48-pin TQFP 44-pin TQFP	56-pin QFN 68-ball WLCSP 76-ball WLCSP

* Maximum number of comparators (dedicated low-power comparators + comparators configured using opamps)

APPLICATION EXAMPLE: INDUCTION COOKTOP

PSoC Enables:

- Liquid-tolerant capacitive touch interface for buttons and sliders
- Proximity detection
- Humidity and temperature-sensing interface via integrated analog front end
- Induction coil IGBT driver control
- Other control and interface functions such as fan control, segment LCD, and Piezo speaker

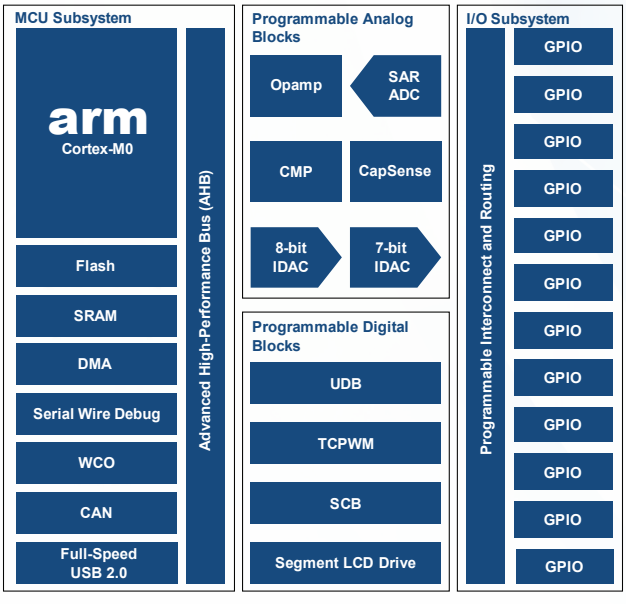


PSoC 4200 FAMILY

Programmable Digital Family

The PSoC 4200 family boosts the flexibility and performance of the PSoC 4 portfolio by adding programmable, Universal Digital Blocks (UDBs). UDBs can be configured to set-up custom digital interfaces, state machines, and custom logic functions. The PSoC 4200BL includes an integrated Bluetooth Low Energy radio and subsystem.

PSoC 4200 FAMILY BLOCK DIAGRAM



PSoC 4200 FAMILY FEATURES AT A GLANCE

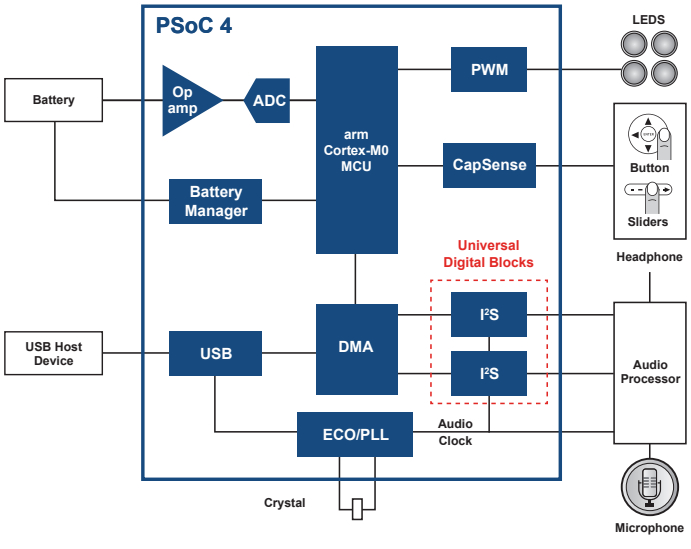
	PSoC 4200	PSoC 4200DS	PSoC 4200M	PSoC 4200L	PSoC 4200BL
Max CPU Speed	48 MHz	48 MHz	48 MHz	48 MHz	48 MHz
Flash (KB)	16 - 32	32 - 64	32 - 128	64 - 256	128 - 256
SRAM (KB)	4	8	4 - 8	8 - 32	16 - 32
ADC	12-bit 1Msps SAR	0	12-bit 1Msps SAR	12-bit 1Msps SAR	12-bit 1Msps SAR
Opamps	2	0	4	4	4
Comparators*	4	2	6	6	6
Timers / Counters / PWMs	4	4	8	8	4
Serial Interfaces (I^2C/ SPI/UART)	2	3	4	4	2
CapSense Blocks	1	0	1	2	1
BLE	No	0	No	No	4.1 / 4.2
Universal Digital Blocks	4	4	4	8	4
USB Full Speed Device Controller	No	No	No	Yes	No
CAN Controller	0	0	2	2	0
Max GPIO	36	21	55	98	36
Packages	48-pin TQFP 44-pin TQFP 40-pin QFN 28-pin SSOP 35-ball WLCSP	28-pin SSOP 25-ball WLCSP	68-pin QFN 64-pin TQFP 48-pin TQFP 44-pin TQFP	124-pin BGA 68-pin QFN 64-pin TQFP 48-pin TQFP	56-pin QFN 68-ball WLCSP 76-ball WLCSP

* Maximum number of comparators (dedicated low-power comparators + comparators configured using opamps)

APPLICATION EXAMPLE: USB DIGITAL MICROPHONE

PSoC Enables:

- High-performance USB audio streaming using DMA and precision clocks, allowing up to 24-bit 96-kHz stereo
- Up to eight I^2S audio channels using Universal Digital Blocks (UDBs)
- Capacitive-touch interface
- Battery management with programmable analog front end
- LEDs with TCPWM

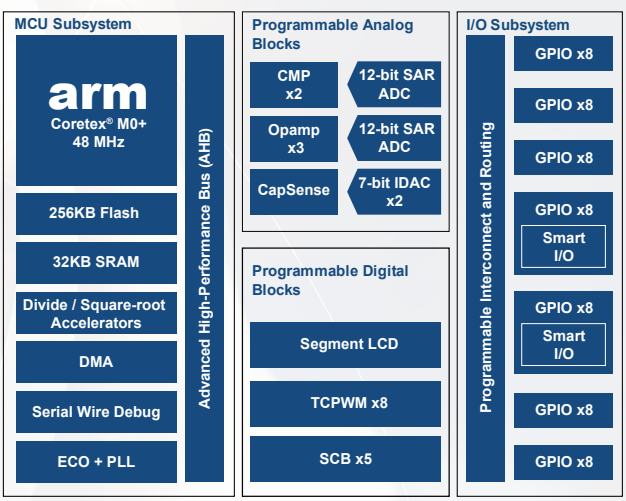


PSoC 4500 FAMILY

Motor and Power Control Family

The PSoC 4500 Family adds compute capability and abundant analogs to the 32-bit Arm Cortex-M0/M0+ PSoC 4 Portfolio of products to enable efficient and integrated solutions. This family includes the PSoC 4500 S-Series that features divide and square-root compute accelerators, dual 12-bits ADCs for high-performance motor control and power conversion solutions.

PSoC 4500 FAMILY BLOCK DIAGRAM

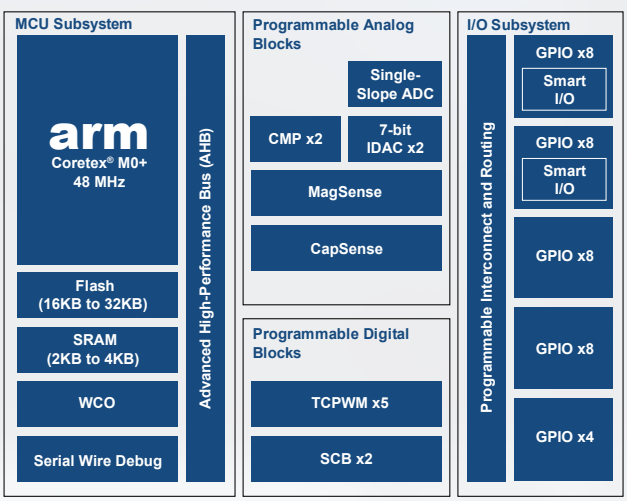


PSoC 4700 FAMILY

Sense Anything Family

The PSoC 4700 Family adds advanced sensing technologies to the 32-bit Arm Cortex-M0/M0+ PSoC 4 Portfolio of products to enable innovative next-generation solutions. This family includes the PSoC 4700 S-Series that features, MagSense™, an advanced inductive sensing technology for highly reliable human machine interfaces, fully waterproof interfaces and other new, innovative solutions.

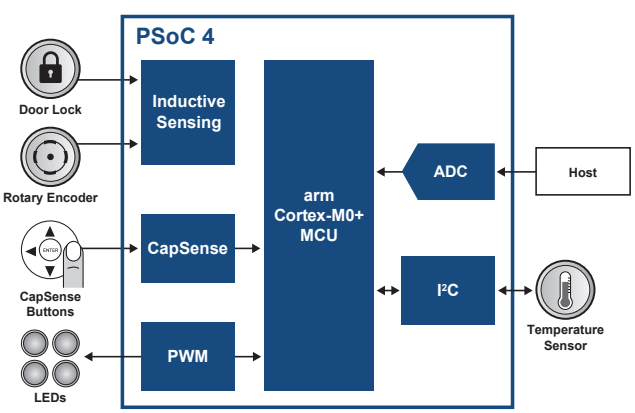
PSoC 4700 FAMILY BLOCK DIAGRAM



APPLICATION EXAMPLE: WASHING MACHINE

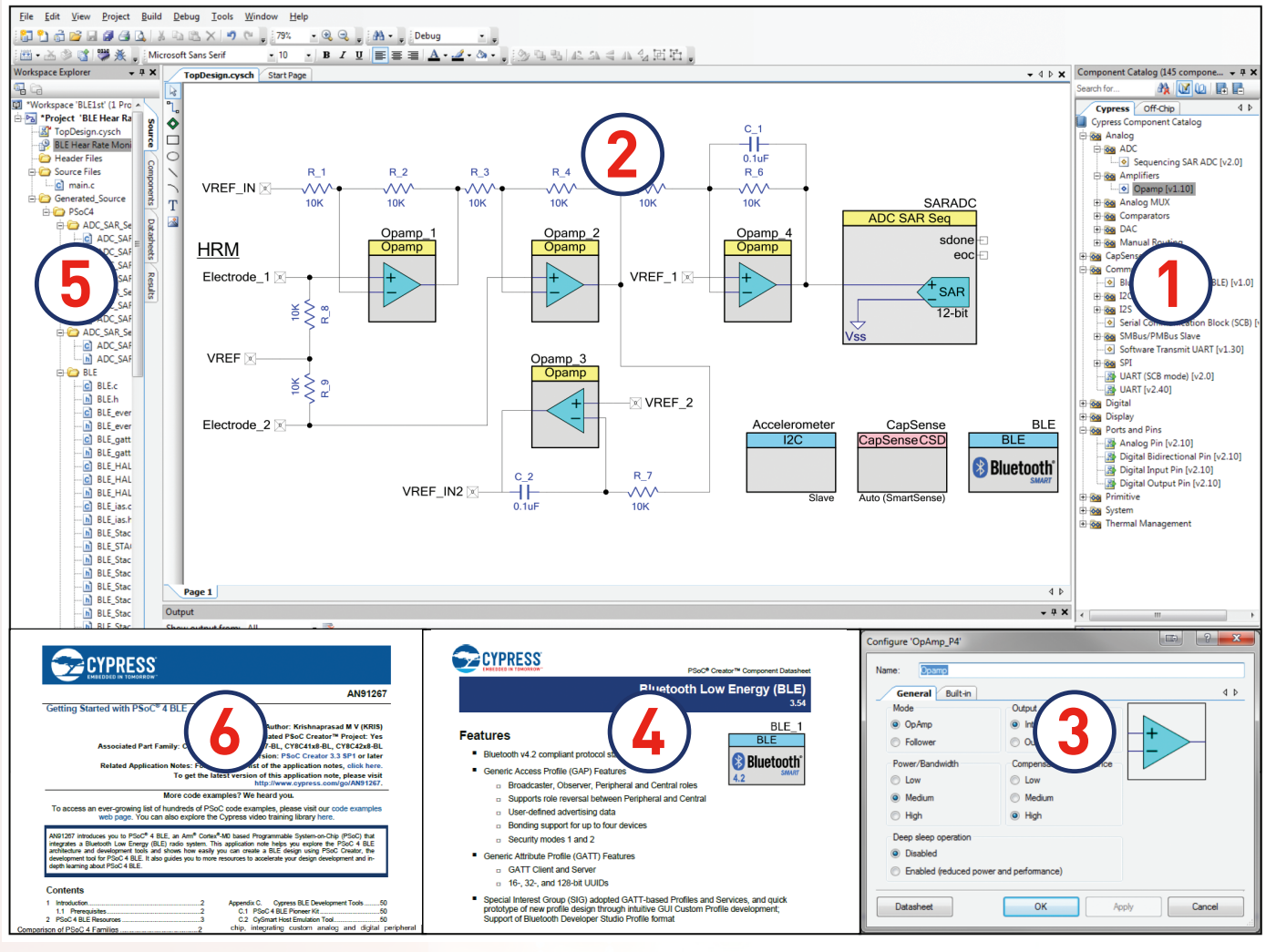
PSoC Enables:

- Sleek, futuristic user interfaces with metallic overlays and inductive-sensing rotary knobs
- Superior performance with best-in-class noise immunity
- Simplified production with AutoTuning™ algorithms to compensate for manufacturing variations
- Reduced system cost with a highly integrated solution



PSoC CREATOR IDE

PSoC Creator is an Integrated Design Environment (IDE) that enables concurrent hardware and firmware editing, compiling and debugging of PSoC 4 systems. Applications are created using schematic capture and over 150 pre-verified, production-ready peripheral Components.



1. Explore the library of 150+ PSoC Components
2. Drag and drop Component icons to complete your hardware system design in the main design workspace (e.g., use the BLE Component for Bluetooth Smart designs)
3. Configure Components using the Component Configuration Tools
4. Access Component datasheets directly from the Component Configuration Tools
5. Co-design your application firmware and hardware in the PSoC Creator
6. Use a Getting Started App Note:
   - Getting Started with PSoC 4 (AN79953)
   - Getting Started with PSoC 4 BLE (AN91267)
   - Getting Started with CapSense (AN64846)

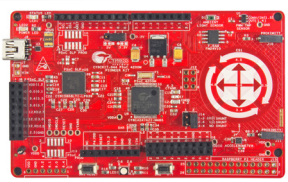
PSoC 4 DEVELOPMENT KIT EXAMPLES

Make It Smarter

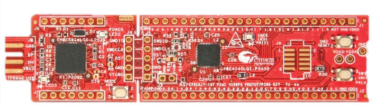
Make It Connected

Make It Easy To Use

INTELLIGENT ANALOG KITS

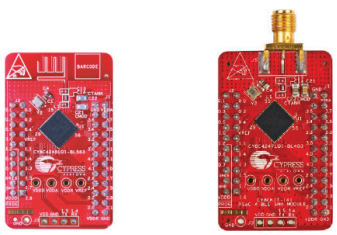


$25 PSoC 4 M-Series Pioneer Kit (CY8CKIT-044)

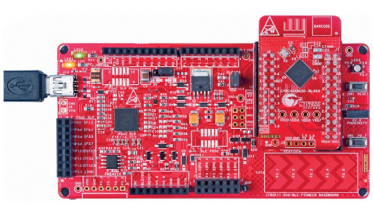


$10 PSoC 4100PS Prototyping Kit (CY8CKIT-147)

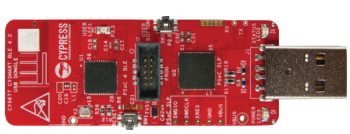
BLUETOOTH® LOW ENERGY (BLE) KITS



PSoC 4 BLE Modules* with PCB or external antenna
$15 (CY8CKIT-143-A) $20 (CY8CKIT-141)

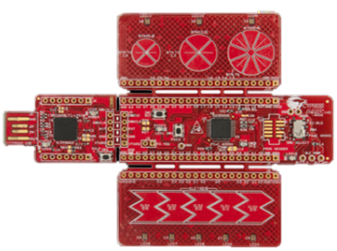


$49 PSoC 4 BLE Pioneer Kit (CY8CKIT-042-BLE-A)

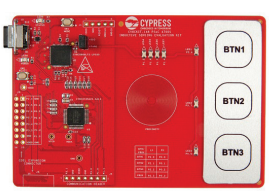


$20 CySmart BLE USB Dongle (CY5677)

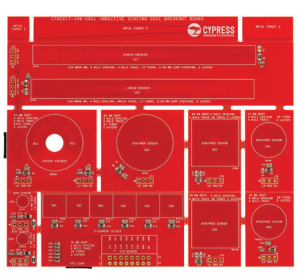
HMI KITS FOR CAPACITIVE AND INDUCTIVE SENSING



$20 PSoC 4100S Plus Prototyping Kit (CY8CKIT-149)



$49 PSoC 4700 Inductive Sensing Evaluation Kit (CY8CKIT-148)



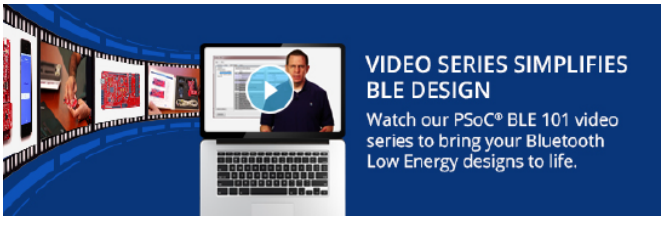
$30 PSoC 4700 Inductive Sensing Coil Breakout Board

PSoC 4 Kit Selector: www.cypress.com/psoc4kits

* Modules can be used independently or with PSoC Pioneer kits

PSoC 101 Video Training

Cypress offers a wide array of step-by-step video tutorials to help you through various design challenges. Check them out at http://www.cypress.com/video-library/PSoC.



Join the PSoC 4 Online Community

CYPRESS
DEVELOPER
COMMUNITY 3.0

The Cypress online community enables you to engage and collaborate with both Cypress experts and other embedded engineers around the world. You can also access knowledge base articles (KBAs) for instant access to information that can help you solve common design problems.

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.

CYPRESS
EMBEDDED IN TOMORROW™

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