Embedded Solution for Smart Home Appliances

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06/07/2017

Cypress 3.0: Global Embedded Systems Leadership

Market and Product Leadership

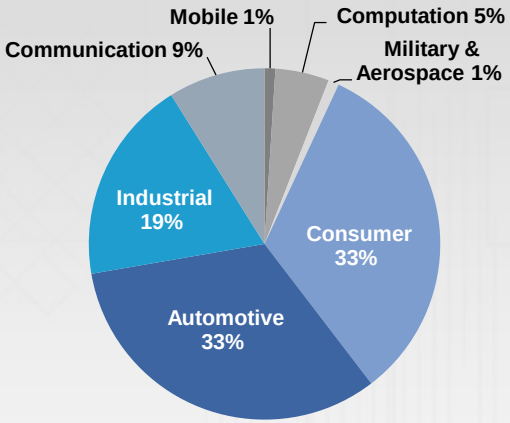
- No. 1: Automotive instrument cluster MCUs
- No. 1: USB-C controllers
- No. 1: SRAM & NOR Flash memories
- No. 2: USB solutions
- No. 3: Automotive MCU & memory
- Most widely deployed Wi-Fi/Bluetooth wireless connectivity solutions for the IoT
- The industry's best mixed-signal MCU solutions

Cypress 3.0: The Next Generation

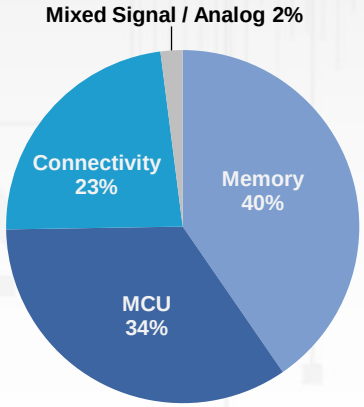
- Sell solutions with wireless, MCU, memory, analog, & USB complete with software & tools
- Play in markets that matter where we can help our customers to make a difference
- Provide customers with a turnkey path to new products, new markets and new revenue
- Make our products easy to use, accelerating time to market and time to revenue

Cypress Q1 2017 Results

By End Market



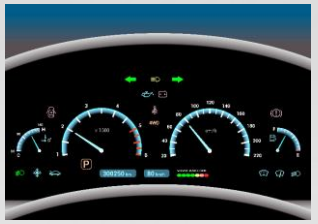
By Solution



Q117 non-GAAP revenue: $531.9M

Cypress Target Applications

DRIVER SAFETY



CLUSTER

WEARABLES

SMART FACTORIES

SMART HOME

HEALTHCARE

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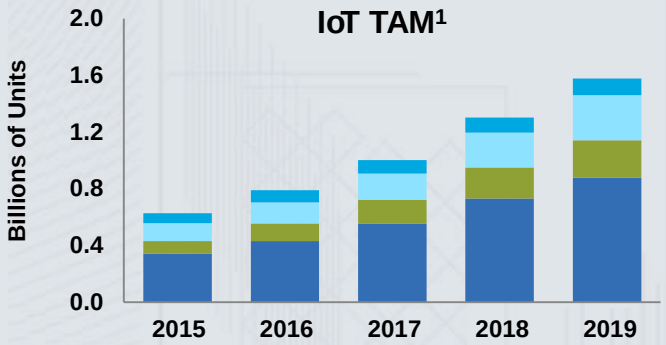
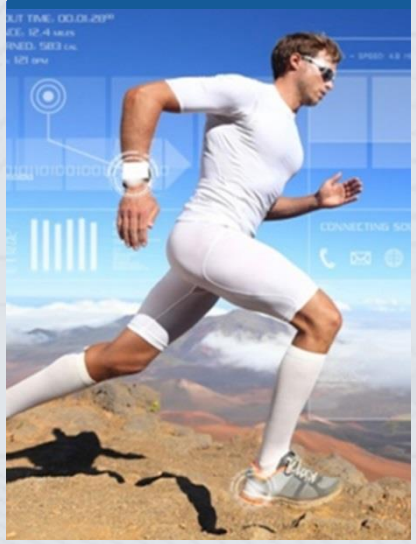
IoT: Complete System Solutions With Wireless + MCUs

Cypress MCUs, connectivity, power management and memory solutions are critical for the IoT



- Cypress offers leading Wi-Fi / Bluetooth / BLE combo solutions
- Ultra-low-power, secure MCUs such as PSoC 6 are purpose-built for the IoT
- Complete software solutions such as the WICED SDK make getting connected fast & easy and accelerate time to market

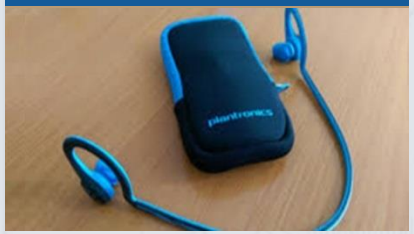
Wearables



Smart Factories

Connected Cars

Audio Accessories



Smart Appliances

Medical

Communications

IoT is the wireless connectivity piece of the Automotive, Industrial and Consumer end markets

[1] Source: ABI Research, Berg Insight, Global Semiconductor Alliance, Strategy Analytics, Broadcom/Cypress

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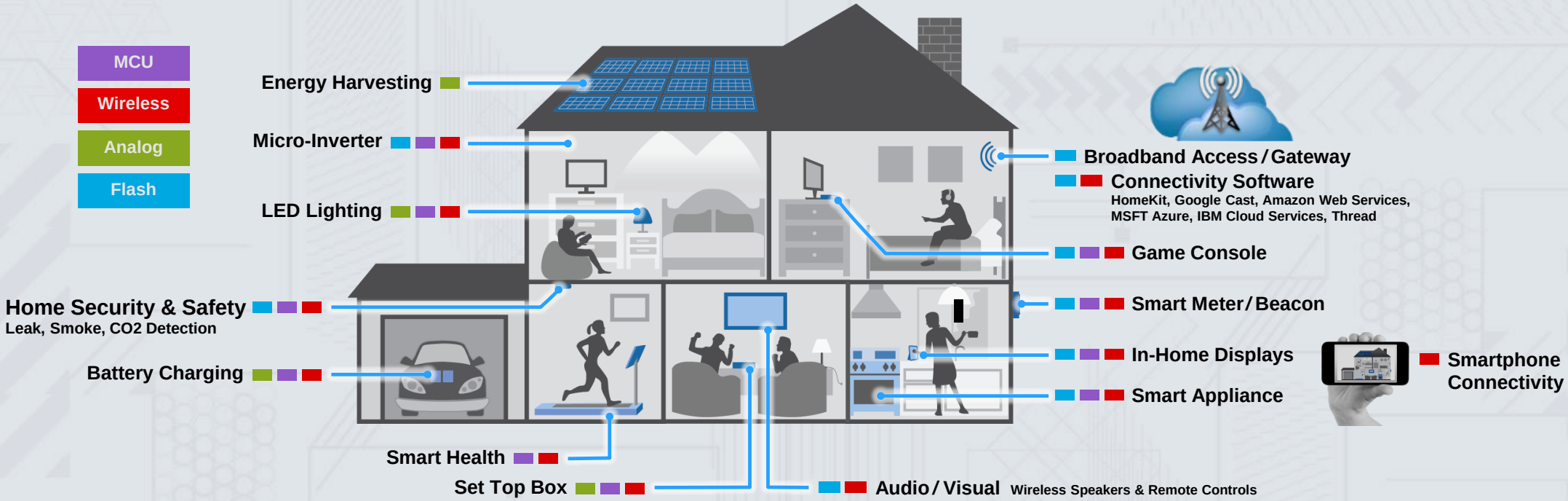
Consumer: Focus on Connected Home



Cypress' MCUs, wireless solutions, analog and flash memories make getting connected fast and easy

- Broad portfolio of connectivity solutions offering Wi-Fi / Bluetooth / Zigbee / Thread and USB
- Low-power, high-reliability PSoC MCU solutions and software enable the fast and easy design of sensor-based systems that provide real-time updates on energy usage, lighting and home security, enhancing user convenience and safety
- Seamless connectivity with all major home automation platforms, including Apple's HomeKit, GoogleCast, Amazon's Alexa, and Cloud services such as AWS, Bluemix, Azure, Alibaba
- WICED software development platform, community, ecosystem and IP make getting connected fast and easy

Segment Focus: Smart Appliances

Cypress is a Top 5 supplier of solutions for air conditioners, stoves, refrigerators and other home appliances

Cypress' embedded systems solutions—including interface, sensor, wireless connectivity, control and display applications—have become a differentiating factor in a broad array of home appliances

HMI and Graphical Display
Hardware 2D graphics acceleration
CapSense-enabled buttons and rotary encoding
CapSense touchscreen control

Drum Vibration Analysis
System control

Liquid-Level Detection
Capacitive sensing

Water Pump Control
System control

Connectivity
Wi-Fi and Bluetooth for control, diagnostics, cloud applications and service

Inductive Door Lock
Analog sensing & control

Safety Features
Voltage/Current hardware monitoring
Water temperature sensing

Motor Control
Multi-function timers
Programmable pulse generation
Quadrature position/revolution counting

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Cypress' Industry-Leading Portfolio of Embedded Solutions

Wireless radio standards and combinations + WICED SDK IoT platform

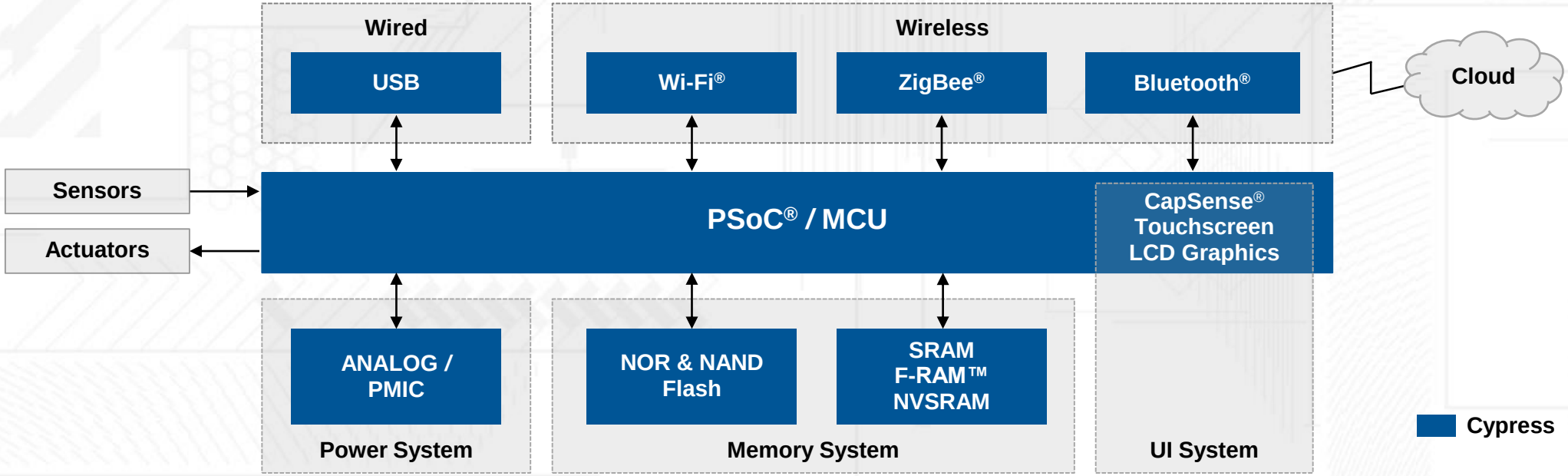
- Wi-Fi® (802.11ac, 802.11bgn), Bluetooth (BR, EDR, BLE), 802.15.4 (ZigBee®, Thread)
- Advanced coexistence algorithms for multi-radio (Wi-Fi + Bluetooth + 802.15.4) platforms

Broad portfolio of ARM®-based MCUs + revolutionary PSoC Creator™ IDE

- PSoC® 4: ARM Cortex® M0 and M0+ devices ideal for HMI, sensor hubs, and other mixed-signal sub-systems
- PSoC 6: Most-flexible, lowest-power, dual-core ARM Cortex®-M4 and M0+ MCU—purpose-built for the IoT

Complete portfolio of memories for embedded systems

- NOR Flash (program memory), SRAM (buffering), F-RAM™ (data logging), NAND (storage)



IoT Portfolio Roadmap

IoT Product Feature	Full-Production Devices	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
BLE/BT/ 802.15.4 + MCU	20736 BLE4.1 CM3 SoC 20737 BLE4.1 Secure CM3 SoC 20735 BLE4.2 CM4 SoC 20706 BT4.2 SoC 20707 BT4.2 HCI-UART 20704 BT4.2 HCI-over-USB/UART	PSoC 6 BLE Low-Power BLE5.0 Dual Core, CapSense SoC 20719 Low-Power BT/BLE4.2 SoC 20729/39 BT/15.4 + MCU				
Wi-Fi and/or BT Combo	43569 2x2ac DB w/USB 867-Mbps, BT4.1 43455 1x1ac DB 433-Mbps, BT4.2 4354/6 2x2ac DB w/PCIe/SDIO 867-Mbps, BT4.1 43596 2x2ac RSDB 867-Mbps, BT4.2 43362 1x1n SB 72-Mbps 43364 1x1n SB 96-Mbps 4343W 1x1n SB 96-Mbps, BT4.1 43438 1x1n SB 96-Mbps, BT4.1 43340 1x1n DB 150-Mbps, BT4.0					
WIFI & Combo + MCU	43903 1x1n SB 160-MHz R4 43907 1x1n DB 320-MHz R4	54907 1x1ac DB 320-MHz R4				

Cypress has developed an extensive Partner Ecosystem and supports Wi-Fi and Wi-Fi Combo modules from our partners for all customer applications. Module details are available in *IoT Solutions Guide*.

Sampling Development Production

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Wireless Protocols in The Home

Wi-Fi

De-facto Primary Home Network

Whole Home Audio Entertainment

Bluetooth-Bluetooth Low Energy

Music

Sensors

MESH- First application profile is lighting

HomeKit: Apple

Wi-Fi and BLE centric, offering bridging to other devices

iOS device controlled and uses Apple TV as your HUB for remote control

Siri enabled

Zigbee/Thread

802.15.4 Mesh and low power sensors

Zigbee Light Link – Hue…

Zigbee established footprint in the home with Cable & Sat service providers for sensors

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Expanding Wi-Fi:
The Backbone of IoT Ecosystem

11ac Smartphones and Infrastructure

Infrastructure and Notebosoks/PCs

Smartphones and Tablets

Digital TVs

What's Next …

Everything Else

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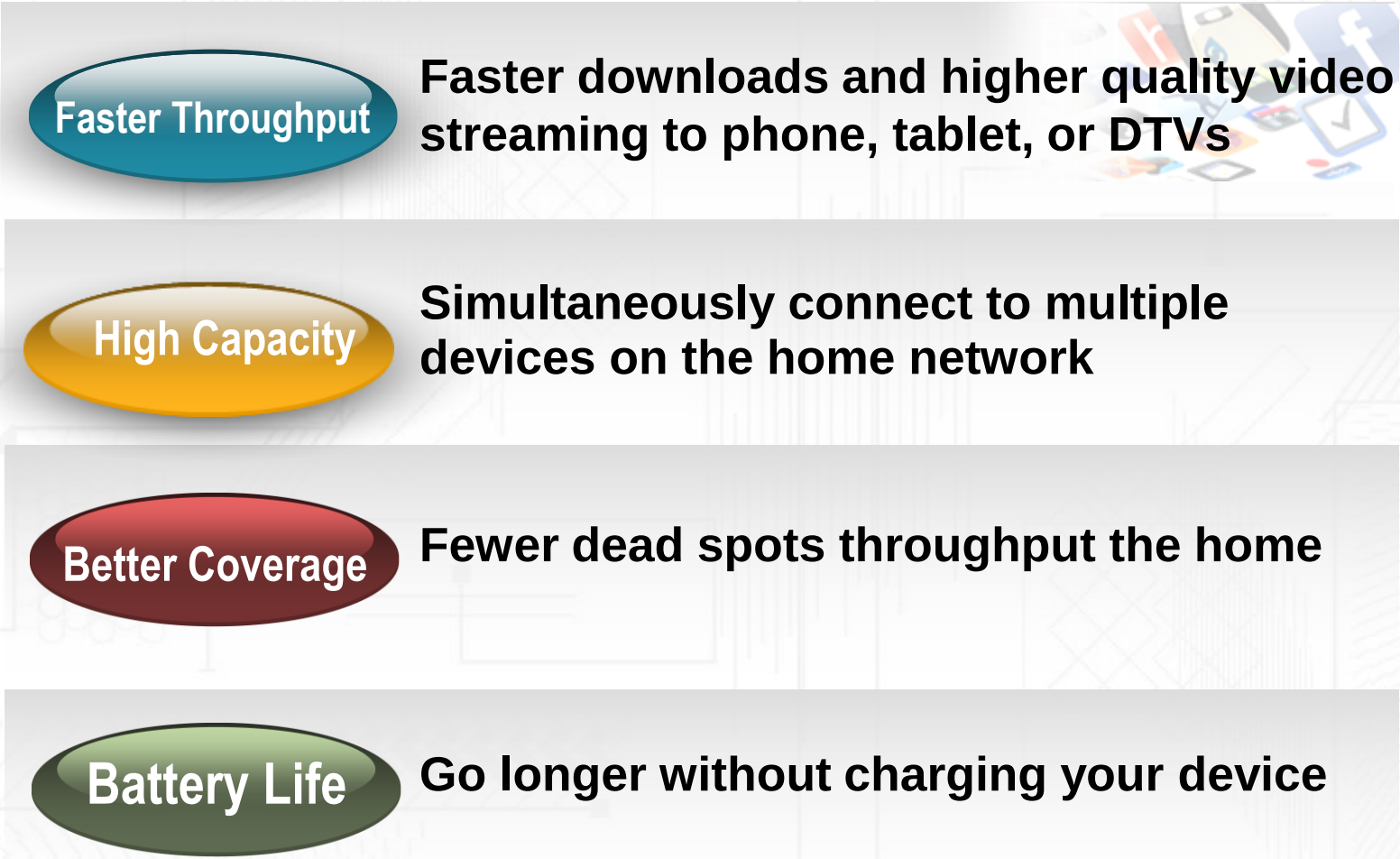
802.11ac Key Benefits



802.11ac Networking Enhancements

5 GHz Spectrum	More channels and less interference
80 MHz Bandwidths 256QAM	Faster connection rates
Dynamic Channel Management	Efficiency improvements for network throughput and capacity
Standardized Beam-forming	Improved performance over range

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Why 11ac Benefits IOT Applications

- **The Industrial IoT needs 11AC:**
  - More robust, more reliable connections with latest security standards
  - Enterprise infrastructure is AC, so network throughput is benefited
  - Beamforming for enhanced range
  - Node density benefits from transmission speeds which allow for shorter on-air time and cleaner air.

- **Home and Consumer IoT needs 11AC:**
  - Dual-band for mixed solutions with Audio/Video entertainment and data
  - Beamforming for enhanced range
  - Better coexistence with crowded 2.4 GHz band and BT/BLE devices
  - Improved network performance for multiple users

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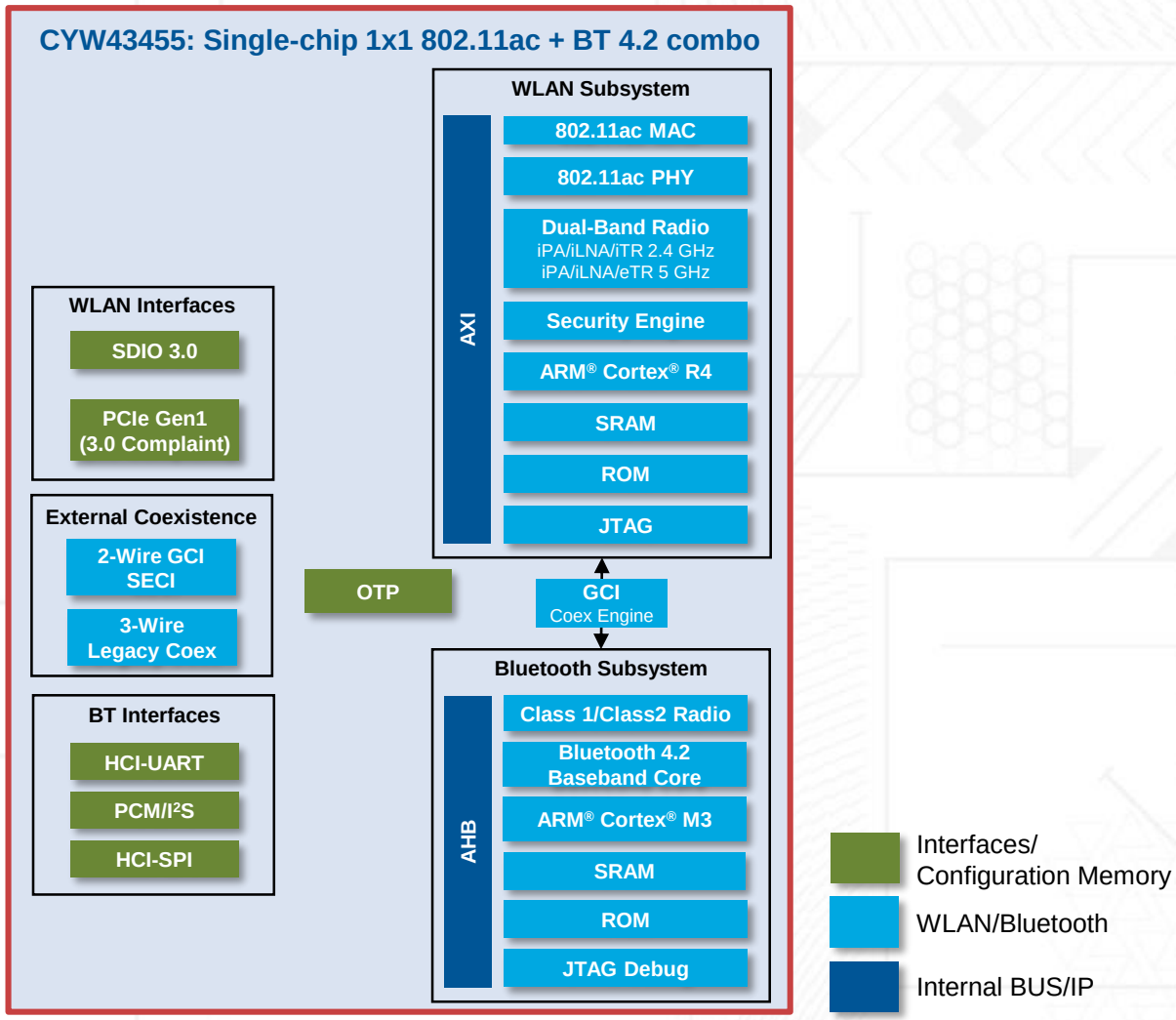
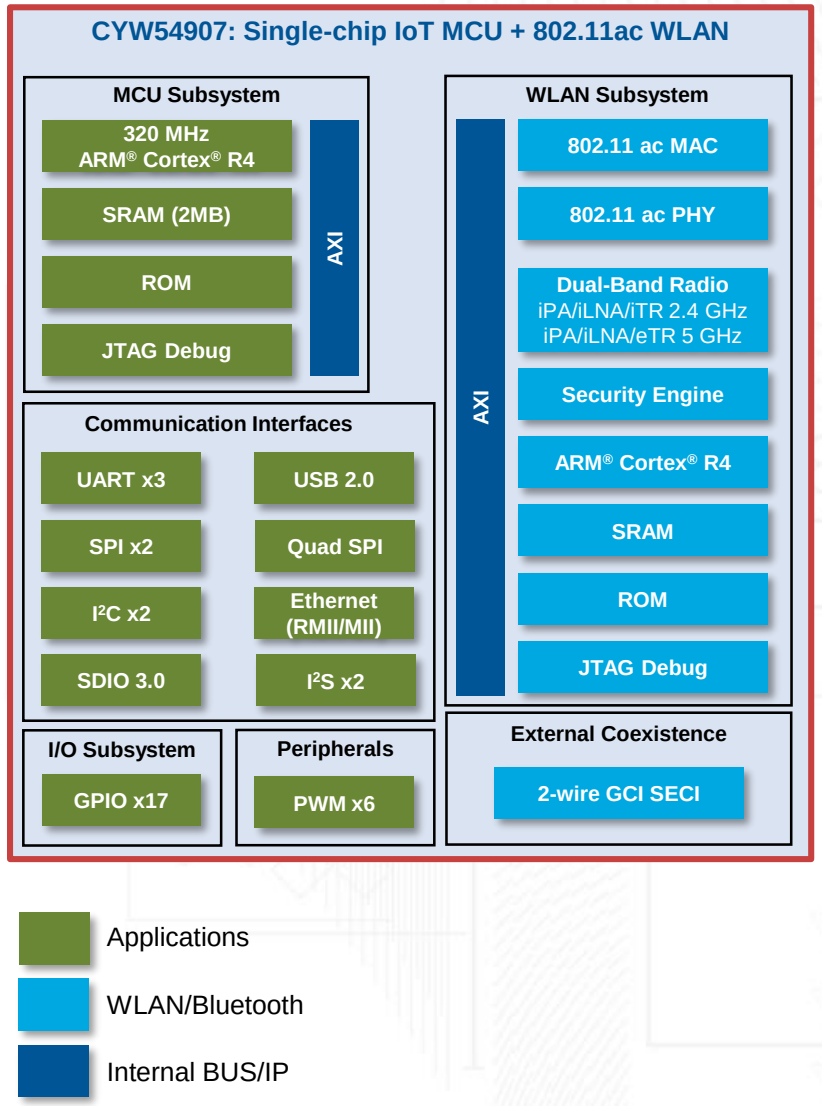
CYW43455: Multi-Radio, Wireless Connectivity For IoT

- **High-performance Wi-Fi**
  - 802.11ac MAC/PHY with 256-QAM
  - Legacy 802.11a/b/g/n/ compatible
  - 20/40/80 MHz channels
  - 1x1 with up to 433.3 Mbps PHY data rates
  - Dual-band (2.4 GHz/5 GHz) radio
- **Dual-Mode Bluetooth**
  - Bluetooth 4.2 complaint
  - Basic Rate + Enhanced Data Rate + Bluetooth Low Energy
  - Class 1 or Class 2 transmitter
  - HCI-UART/SPI or PCM/I^2S for audio
- **Advanced coexistence engine for optimum wireless performance**

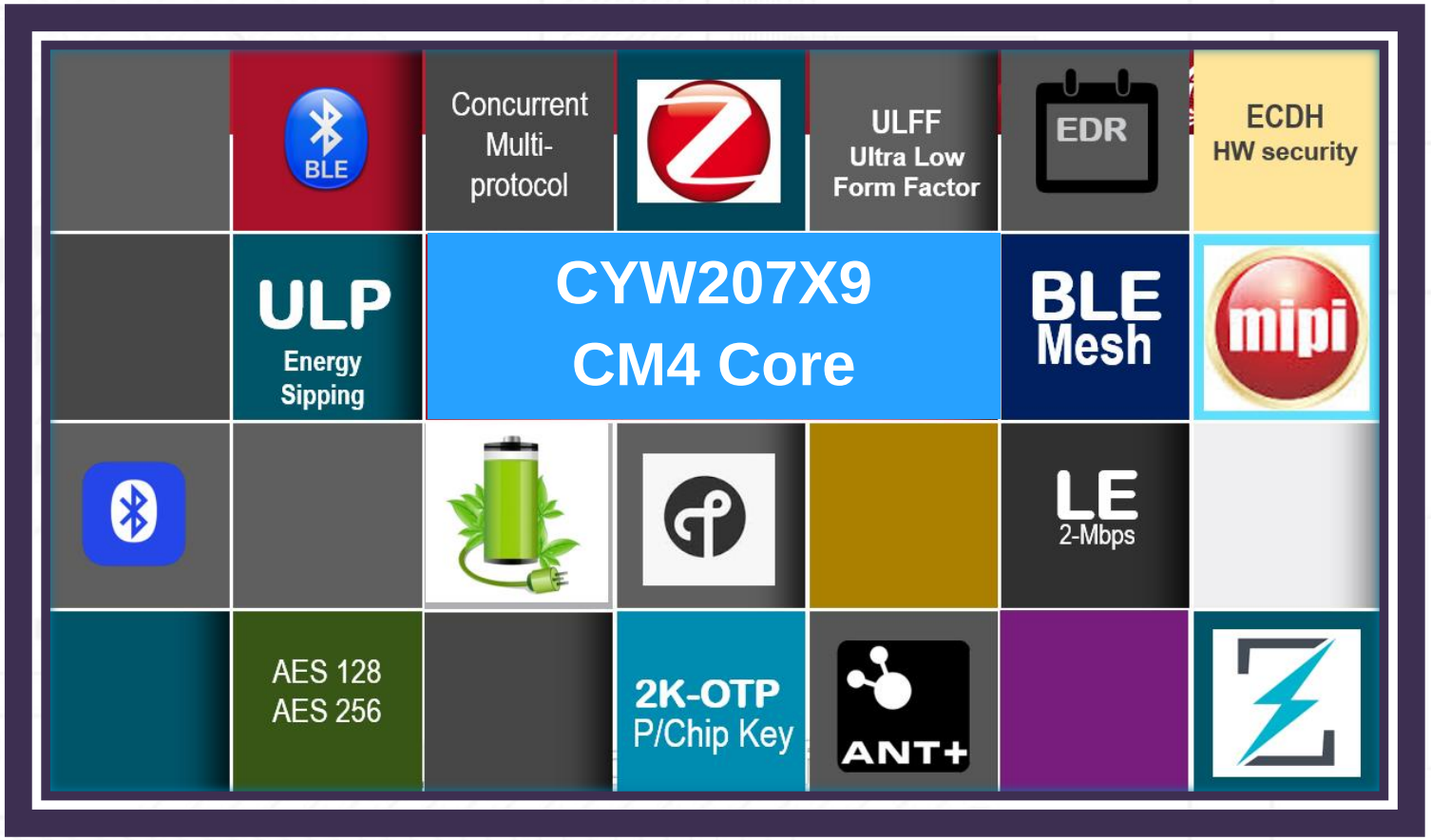


CYW54907: Complete System-on-Chip For IoT

- **Advanced Wi-Fi Connectivity**
  - 802.11ac MAC/PHY with 256-QAM
  - Legacy 802.11a/b/g/n/ compatible
  - 20/40/80 MHz channels
  - 1x1 with up to 433.3 Mbps PHY data rates
  - Dual-band (2.4 GHz/5 GHz) radio
- **High-performance applications processor**
  - 320 MHz Cortex R4 with 2 MB SRAM for code/data
  - Quad-SPI flash interface with 40 Mbps transfer rate
  - On-chip ROM with IPV6 network stack
  - Dedication fractional PLL for audio clock
  - Easy-to-use WICED SDK for development
  - Rich set of peripheral/interfaces – USB 2.0, SDIO 3.0, RMII/MII etc.



CYW207X9 - Multi-protocol ULP SoC for Smart Home & Wearables



- **Ultra Low Power**
  - < 5.5/5.7mA Tx/Rx LE @0dBm
  - < 8.9mA Tx/Rx 0dBm @15.4
  - < 8uA 1s LE beacon
- **Multi-protocol**
  - BLE 4.2 → 5.0
  - LE 2Mbps
  - BT 4.2 + EDR
  - Zigbee/Thread
  - ANT+
  - Concurrent BT + LE + 15.4
- **Peripheral Interfaces**
  - Q-SPI, SPI, I2C, UART
  - MIPI-DBI-C
  - I2S, PDM
- **Security**
  - AES128, AES256, ECDH
  - Secure Flash (Non-probe)
  - OTP (per chip security)

Cover home automation, security, & wearables

Enable rich and diverse smart home use cases

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CYW20719

High-Performance Bluetooth MCU w/Security

Applications

Medical, home automation, wearables, POS, audio

Features

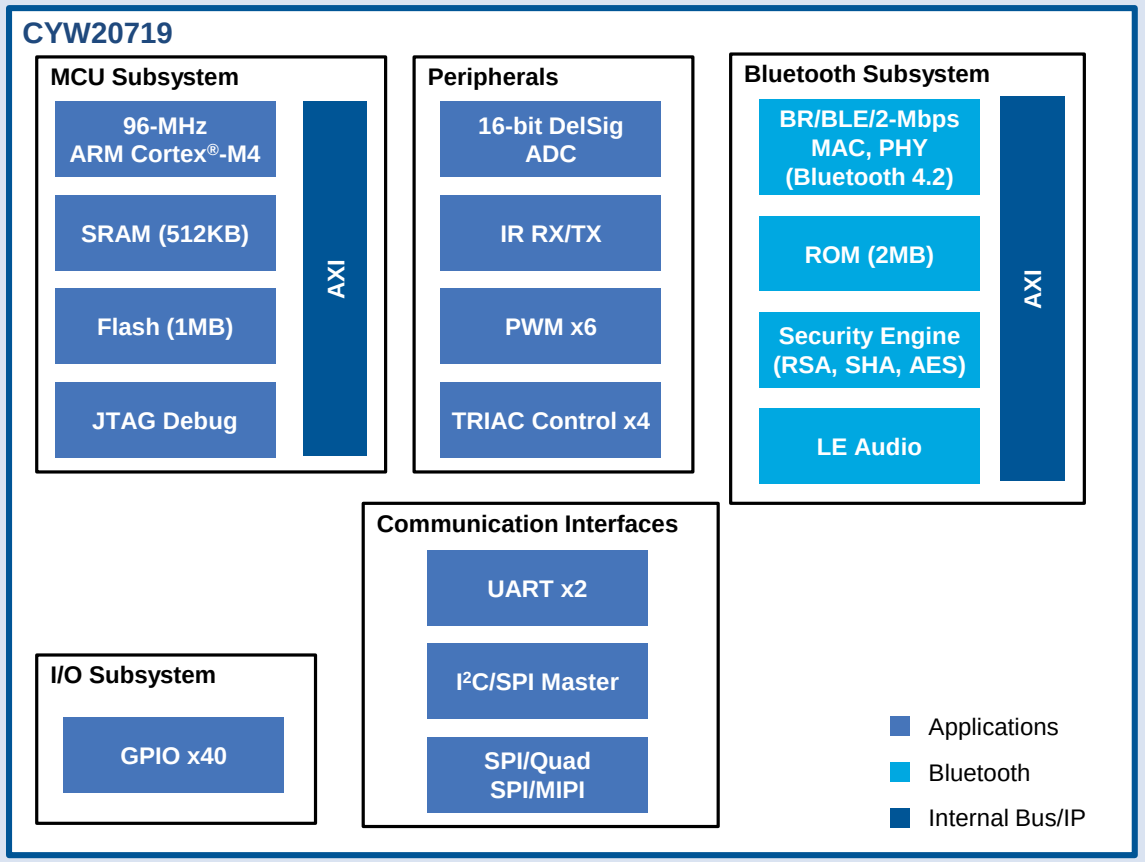
- **Bluetooth v4.2, Basic Rate + Bluetooth Low Energy**
  - Industry's most widely deployed Bluetooth stack
  - Industry's lowest-power radio
  - Proprietary low-energy audio (LE Audio) support
  - 2-Mbps proprietary BLE support
  - Secure over-the-air (OTA) firmware upgrade
  - RSA, X.509, SHA, AES128
- **MCU Subsystem**
  - 96-MHz Cortex®-M4
  - 512KB SRAM, 1MB Flash
- **Packages**
  - 40-pin QFN (5 x 5 mm)
  - 80-ball WLCSP (2.2 x 2.2 mm)
- **Supported in WICED STUDIO**

Collateral

Datasheet: CYW207x9 (Contact Sales)

Software: WICED STUDIO

CYW20719: High-Performance Bluetooth MCU w/Security



Availability

Samples: Now **Production:** Q3 2017

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WICED Studio 5.x: The SDK for IoT

To Develop an IoT Application, You Need an SDK that:

Integrates multiple wireless technologies

Wi Fi · Bluetooth · ZigBee

Includes support for necessary protocols

http:// · MQTT · {REST} · AMQP

Enables interoperability with the existing ecosystem

Offers connectivity to leading cloud services

Cloud Services

amazon web services · IBM Bluemix · Alibaba Cloud (aliyun.com) · Microsoft Azure

WICED STUDIO by CYPRESS

SOFTWARE DEVELOPMENT KIT

Wireless Internet Connectivity for Embedded Devices

WICED Studio is the *only* SDK that provides all the above and enables ease-of-use

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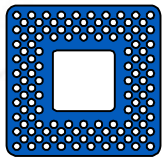
Our Global Partner Ecosystem to Enable IoT

A global partner ecosystem enables you to get the level of support you need



Module Makers

- BPIL
- muRata — INNOVATOR IN ELECTRONICS
- MITSUMI
- USI
- AzureWave
- CyberTAN

Technology Partners

- ZENTRI
- ST
- Ayla Networks
- Google
- NXP
- Particle
- Apple
- IBM Bluemix
- electric imp
- amazon web services™
- adb
- CIKLUM — EMPOWERING COLLABORATION

Value-Added Resellers

- CEL
- Cyntec — A Delta Group Company
- LANTRONIX®
- Inventek Systems — Embedding Connectivity Everywhere
- Anaren® — What'll we think of next?™
- Laird™
- ZLG®
- MXCHIP®
- SAVITECH Corp.

ODMs

- CoAsia Microelectronics Corp.
- Honeywild — Honey from the World
- DEXATEK
- JABIL
- MAXWELL GUIDER
- INGICS TECHNOLOGY
- Chicony
- PRIMAX®

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Cypress MCU Portfolio

8-Bit	32-Bit ARM® Cortex®-M0/M0+	32-Bit ARM® Cortex®-M3	32-Bit ARM® Cortex®-M4	32-Bit ARM® Cortex®-M7
High Analog Integration	**Ultra-Low-Power 8-/16-Bit Replacement**	**Mid-Range Performance**	**High Performance**	**Next Generation**

Analog and Digital Integration

Programmable System-on-Chip (PSoC) is a brand of Cypress MCUs for the broad-base embedded market that delivers an ARM Cortex-M CPU (PSoC 4+) with unique software-defined peripherals and CapSense capacitive sensing

Flexible MCU (FM) is a portfolio of high-performance ARM® Cortex®-M-based MCUs for industrial and consumer applications

PSoC 3
8051 CPU
67 MHz, 64KB Flash
Up to 19 PAB, 30 PDB, 72 I/Os

PSoC 1
M8C CPU
24 MHz, 32KB Flash
16 PAB, 16 PDB, 64 I/Os

8FX
8-bit RISC MCU
16 MHz, 32-50KB Flash

PSoC 4
Cortex®-M0/M0+
48 MHz, 256KB Flash
Up to 13 PAB, 20 PDB, 98 I/Os

PSoC Analog Coprocessor
CY8C4Axx
48 MHz, 32KB Flash
Up to 12 PAB, 11 PDB, 38 I/Os

FM0+ MCUs
Cortex®-M0+
40 MHz, 512KB Flash, 102 I/Os

PSoC 5LP
Cortex®-M3
80 MHz, 256KB Flash
20 PAB, 30 PDB, 72 I/Os

FM3 MCUs
Cortex®-M3
144 MHz, 1.5MB Flash, 154 I/Os

PSoC 6
Cortex®-M4 and Cortex®-M0+
NDA Required, Contact Sales

FM4 MCUs
Cortex®-M4
200 MHz, 2MB Flash, 190 I/Os

PSoC 7
Cortex®-M7
NDA Required, Contact Sales

[1] A programmable analog block that is configured using PSoC software to create analog front ends, signal conditioning circuits with opamps and filters
[2] A programmable digital block that is configured using PSoC software to implement custom digital peripherals and glue logic

	Concept	Development	Sampling	Production
Status				
Availability			QQYY	QQYY

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PSoC 4 S-Series Enables Reliable Capacitive-Sensing

- **Cypress's fourth-generation, low-power CapSense solution**
  - Up to 56 CapSense I/Os with an average current consumption of 3 µA per sensor
  - SNR >300:1 to deliver robust noise immunity and Liquid Tolerance
  - Mutual-capacitance sensing[1] to implement advanced features like liquid-level sensing[2]
  - SmartSense Auto-tuning[3] to reduce time-to-market and increase manufacturing robustness

Touch Buttons: 2003

LG Chocolate
(First Generation)

Cypress's CapSense begins with buttons and sliders

Liquid Tolerance: 2008

Whirlpool Dishwasher
(Second Generation)

Liquid Tolerance, Proximity Sensing and improved noise immunity

SmartSense: 2010

HP TouchSmart Printer
(Third Generation)

Remove manual tuning with SmartSense™ Auto-tuning

1B Units Shipped: 2013

Samsung Galaxy Note 3
(Third Generation)

One billionth CapSense controller shipped with stylus-activated buttons

PSoC 4 S-Series: 2016

PSoC 4 S-Series
(Fourth Generation)

Superior touch-sensing performance with low power consumption

CapSense is No. 1 solution in sales with over 1 billion units in the field

[1] A capacitive-sensing method that drives a current on a transmit pin and measures the charge on a receive pin; typically used in systems with a large number of closely spaced capacitive sensors
[2] A method to detect liquid-level height using capacitive sensors
[3] A Cypress algorithm that automatically sets and maintains parameters to optimize performance and to continuously compensate for system, manufacturing and environmental changes

PSoC 6: Purpose-Built for the IoT

Emerging IoT devices require increased processing and security without a power and cost penalty

- **Cypress's PSoC 6 portfolio bridges the gap between application processors and standard microcontrollers**
  - Dual-core ARM® Cortex®-M4 and ARM Cortex®-M0+, running at 150-MHz and 100-MHz, ultra-low-power 40nm architecture
  - Industry-leading ultra-low-power design that consumes as little as 22-µA/MHz in active power mode[1] and 4.5-µA in deep sleep modes
  - Best-in-class flexibility with wired and wireless connectivity options, software defined peripherals and industry-leading CapSense®
  - Integrated, hardware-based Trusted Execution Environment (TEE) with secure data storage

*Linked terms are defined in the Glossary

[1] Power specifications are based on the ARM Cortex®-M4 CPU

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