

Introduction to Infineon AIROC™ family

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Burapha University
Infineon Innovation
Launchpad

Infineon

Agenda

1. AIROC™ Bluetooth® and Multi-Protocol
2. AIROC™ Wi-Fi & Bluetooth® Combos
3. Cloud Connectivity Manager Module

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Broad AIROC™ Family Delivers Powerful, Reliable, and Low Power Bluetooth® & Multi-protocol system on chips for your application

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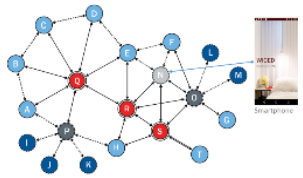
RELIABLE

- **Most widely deployed wireless IP** - more than 1 Billion wireless Infineon devices in the field
- **User Experience - Best interoperability** with installed base of phones sharing IP heritage
- **Strength in Bluetooth® complements Wi-Fi** in IoT applications to ensure reliability.







LOW POWER

- **Ultra low power by design** – very low sleep, transmit, and receive current
- **Low power system architecture** – efficient design techniques to reduce active and idle power
- High-performance and low power RF ensures the **most robust connection** with low power consumption





HIGH PERFORMANCE SoCs

- Best-in-class receiver sensitivity for Bluetooth® LE, Bluetooth® Classic (EDR), and 802.15.4 for best user experience with **no connection drops** and ultra-low power
- Faster throughput: 2 Mbps LE enables **faster** firmware updates
- **Scalable** MIPS for feature rich applications



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AIROC™ Bluetooth® and Multi-Protocol MCU Product Portfolio

	32-Bit Arm Cortex M0 or Cortex-M3	32-Bit Arm Cortex-M4	32-Bit Arm Multi - Core Cortex-Mx
Bluetooth® & Bluetooth® LE	**89072** BT/LE 5.2 CM3 SoC 352KB RAM 12 dBm Tx, Audio **20706** BT/LE 5.2 CM3 SoC 352KB RAM 12 dBm Tx, Audio	**20719** BT/LE 5.1 CM4 SoC 1M Flash/512K RAM 5dBm Tx, Mesh **20721** BT/LE 5.1 CM4 SoC 1M Flash/512K RAM 5 dBm Tx, Audio **20819** BT/LE 5.2 CM4 SoC 256K Flash/176K RAM 4dBm Tx, Mesh **20820/89820** BT/LE 5.2 CM4 SoC 256K Flash /176K RAM 11.5 dBm Tx (LE), Mesh	**Next Generation** Full featured AIROC™ Bluetooth® MCU's that are flexible, high performing, robust, and low power Optimized for power, features and robustness Full featured BT5.X for location and audio AoA/AoD + HADM: location based use cases Advanced Coexistence + Multi-protocol
Bluetooth® LE & 802.15.4		**30739** LE 5.3, 802.15.4, CM4 SoC 1M Flash/512K RAM 5 dBm Tx, Matter Q223 Q423	
Bluetooth® LE	**20736** LE 5.2 CM3 SoC 60KB RAM 4 dBm Tx **PSoC 4-BLE** BT4.2/BT5.1 CM0 SoC Up to 256KB Flash, 32KB RAM 3 dBm Tx	**20835** LE 5.2 CM4 SoC 384KB RAM 12 dBm Tx, Mesh	**20829/ 89829** LE-5.3 2xCM33, 224K RAM 10 dBm Tx, Mesh Q222 Q423 Q124 **PSoC 63-BLE** LE 5.2 CM4 & CM0+ SoC Up to 1M Flash/288K 4 dBm Tx

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Automotive Production Sampling

Infineon Bluetooth & 802.15.4 Portfolio : BLE v5.x Features

Device Type/Features	Bluetooth Standalone Devices				802.15.4/BLE
LE v4.2/5.0 features	20704/20706/20707	20735/20835	20719/20819/ 20820/PSoC6Ble	20829/20830/20832 20831(DM)	30739
Bluetooth Version	BT5.0	BT5.0(BR+ LE)	BT5.0	BT5.2+BT6.0 Ready	BT5.1+15.4
BLE-only/Dual Mode	DM BR/EDR/BLE	BLE	DM BR/EDR/BLE	BLE (20831 is dual mode)	DM BR/EDR/BLE
Data Length Extension	√	√	√	√	√
Privacy 1.2	√	√	√	√	√
Secure Connections	√	√	√	√	√
2-Mbps PHY	×	√	√	√	√
LE Long Range	×	×	×	√	√
LE Advt. Extension	×	×	×	√	√
GATT caching	×	×	×	√	√
A0A/AoD	×	×	×	√	×
Isochronous Channels (LE-Audio)	×	×	×	√	×
HADM	×	×	×	√	×
Availability	Now	Now	Now	Starting Q1'22	Starting Q2-22

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AIROC™ Bluetooth® Module Portfolio

MCU	Silicon	Entry Level	Size	External Antenna	Extended Range(External PA)	Extended Temp
CM0 + CM4	**PSoC™ 63** Single Mode LE 5.0*, 2Mbps PHY, CAPSENSE™	CYBLE-416045-02 1MB Flash, 36 GPIOs, 14 x 18.5 x 2.00 mm				
Cortex-M4	**CYW20719/20721** Dual Mode BT 5.0* 2Mbps PHY	Mesh CYBT-413055-02 EZ-S 1MB Flash, 17 GPIOs, 12 x 16.3 x 1.70 mm Mesh Audio CYBT-413061-02 EZ-S 17 GPIOs, 12 x 16.3 x 1.70 mm SMT	Mesh CYBT-423054-02 EZ-S 1MB Flash, 17 GPIOs, 11 x 11 x 1.70 mm Mesh Audio CYBT-423060-02 EZ-S 1 MB Flash, 17 GPIOs 11 x 11 x 1.70 mm SMT		Mesh CYBT-483056-02 EZ-S 1MB Flash, 20 dBm TX 15 GPIOs, 12.75 x 18.59 x 1.8 mm Mesh Audio CYBT-483062-02 EZ-S 1MB Flash 20 dBm TX , 15 GPIOs, 12.75 x 18.59 x 1.8 mm	
Cortex-M4	**CYW20820** Dual Mode BT 5.0* 2Mbps PHY	Mesh CYBT-243053-02 EZ-S 256KB Flash, 22 GPIOs, +10dBm TX, 12 x 16.61 x 1.70 mm SMT CQ222 External 512 KB SFLASH needed to support MESH	Mesh CYBT-253059-02 EZ-S 256KB Flash, 22 GPIOs, +10dBm TX, 11 x 11 x 1.70 mm SMT CQ222 External 512 KB SFLASH needed to support MESH			Mesh CYBT-243068-02 EZ-S 512KB SFlash, 22 GPIOs, +10dBm TX, 12 x 16.61 x 1.70 mm SMT CQ222
Cortex-M4	**CYW20819** Dual Mode BT 5.0* 2Mbps PHY	Mesh CYBT-213043-02 EZ-S 256KB Flash, 22 GPIOs, 12 x 16.61 x 1.70 mm SMT CQ222 External 512 KB SFLASH needed to support MESH	Mesh CYBT-223058-02 EZ-S 256KB Flash, 22 GPIOs 11 x 11 x 1.70 mm SMT CQ222 External 512 KB SFLASH needed to support MESH	Mesh CYBT-2630xx-02 EZ-S 256KB Flash, +20 dBm, RF Pad or u.FL, 20 GPIOs 12.5 x 19 x 1.95 mm SMT CQ222 External 512 KB SFLASH needed to support MESH	Mesh CYBT-273063-02 EZ-S 256KB Flash, PA/LNA (20 dBm) 20 GPIOs 12.5 x 19 x 1.95 mm SMT CQ222 External 512 KB SFLASH needed to support MESH	
Cortex-M4	**CYW20735** Dual Mode BT 5.0*	Mesh CYBT-343052-02 512KB SFlash, 24 GPIOs, +10dBm TX, 13.31 x 22.4 x 1.95 mm SMT				
Cortex-M4	**CYW20835** Single Mode LE 5.2*	Mesh CYBLE-343072-02 512KB SFlash, 24 GPIOs, +12 dBm TX, 13.31 x 22.4 x 1.95 mm SMT		Mesh CYBLE-33307x-02 512KB SFlash, 22 GPIOs, +12 dBm TX, RF Pad or u.FL 13.31 x 22.4 x 1.95 mm SMT		
Cortex-M3	**CYW20706/20707** Dual Mode BT 5.0*	Mesh CYBT-343026-01 EZ-S 512KB SFlash, 11 GPIOs. +10dBm TX, Audio 12 x 15.5 x 1.95 mm SMT	Mesh CYBT-353027-02 EZ-S 512KB SFlash , 8 GPIOs, +10dBm TX, Audio 9 x 9 x 1.75 mm SMT	Mesh CYBT-3330xx-02 EZ-S 512KB SFlash,, 11 GPIOs +10dBm TX, RF Pad or u.FL Audio 12 x 12 x 1.95 mm SMT		Mesh CYBT-343151-02 EZ-S 512KB SFlash, 11 GPIOs, +10dBm TX, Audio 12 x 15.5 x 1.95 mm SMT
Cortex-M3	**CYW20737** Single Mode LE 5,2* Low Cost	CYBLE-0130xx-00 EZ-S 128KB/0KB SFlash, 16/18 GPIOs 14 x 19 x 2.25 mm SMT				
CM0	**PSoC™ 4-BLE** Single Mode LE 5.1 CAPSENSE™	CYBLE-x120xx-0x EZ-S 128/256KB Flash, 23 GPIOs 14 x 19 x 2.00 mm SMT	CYBLE-x220xx-0x EZ-S 128/256KB Flash, 16 GPIOs 10 x 10 x 1.80 mm SMT CYBLE-x140xx-0x EZ-S 128/256KB Flash, 25 GPIOs 11 x 11 x 1.70 mm SMT	CYBLE-2020xx-01 EZ-S 256 KB Flash, +20 dBm, 19 GPIOs RF Pad or u.FL, 15 x 23 x 2.05/1.55 mm SMT	CYBLE-212006-01 EZ-S 256 KB Flash, +20 dBm, 19 GPIOs 15 x 23 x 2.00 mm SMT	CYBLE-22411x-0x EZ-S 256 KB Flash, PA/LNA (+20 dBm) 25 GPIOs 9.5 x 15.4 x 1.80 mm SMT

Status Availability

Concept

Development

Sampling

QQYY

Production

QQYY

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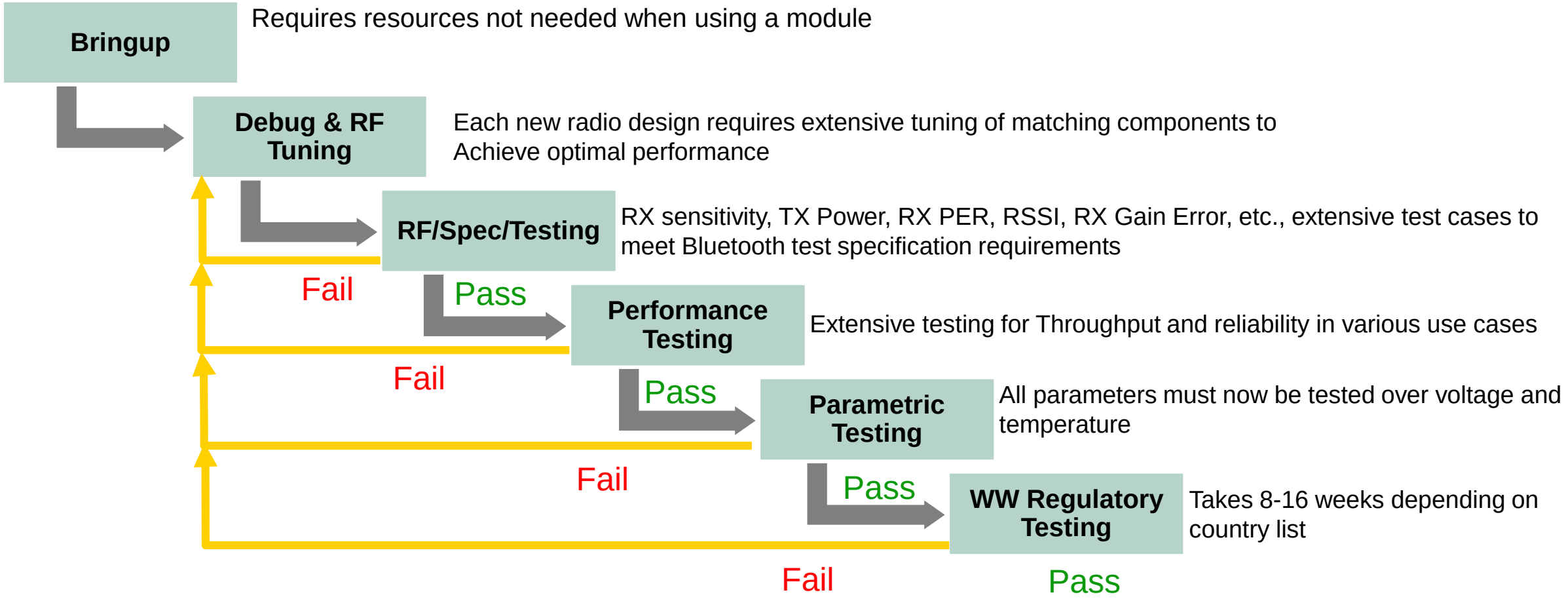
Certified AIROC™ Bluetooth® Modules Minimize Complexity

Simplified Bluetooth RF Design Flow



Infineon AIROC™ Bluetooth Modules reduce risk and minimize time to market

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AIROC™ Bluetooth® and Bluetooth® LE SoC and Module Development Kits

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Bluetooth/Bluetooth LE SoC Silicon Eval Kits





PSoC™ 6 Bluetooth LE and PSoC™ 4 Bluetooth LE Dev Kits





Bluetooth/Bluetooth LE Module Eval Kits






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AIROC™ Bluetooth® and Bluetooth® LE SoC Resources

Consolidated overview	• Bluetooth® and Multi-protocol Overview Page
Development Kits and Software	• Infineon Development Kits • ModusToolbox™ Software and Tools • Bluetooth SDK Code Examples
Bluetooth Product Pages (Features, Datasheets, and more)	• CYW20819 , CYW20820, CYW20835 • CYW20719 , CYW20721 • CYW20736 , CYW20706 • PSoC™ 63 with AIROC™ Bluetooth® LE • PSoC™ 4 MCU with AIROC™ Bluetooth® LE
Developer Community (For Technical Support)	• Bluetooth SDK Developer Community Technical Forum
Other	• IoT Webinars from Infineon • Infineon AIROC™ Bluetooth® Modules

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AIROC™ Wi-Fi & Bluetooth® Combos

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Broad AIROC™ Family Delivers Powerful Wi-Fi for Your Application

RELIABLE

- **Most widely deployed wireless IP** - more than 1 Billion AIROC™ Wi-Fi and Bluetooth® devices in the field
- **Best interoperability** with installed base of Access Points and data-driven Wi-Fi algorithm improvement
- **Strength in Bluetooth® classic complements Wi-Fi** in streaming applications to ensure reliability.







LOW POWER

- **Ultra low power by design** – very low sleep, transmit, and receive current
- **Low power system architecture** – host offloads for keep-alive functions allowing host processor to sleep for longer periods
- High-performance RF ensures the **most robust connection** which substantially reduces power consumption
- **Data-driven Wi-Fi** with 300M datapoints per day for proven low power in real-world conditions



HIGH PERFORMANCE

- High-performance RF design ensures your device works when needed in increasingly congested environments due to **longer range** (more than double some competitors)
- Industry's best **Coex performance**: configuration options per antenna design and system-level use cases
- Real-Time Simultaneous Dual Band enables **demanding applications** requiring connection to an AP and a local network of devices



Infineon AIROC™ IoT Wi-Fi Portfolio

Wi-Fi 4 (802.11n)

43364
SB 1x1 Wi-Fi 4 (11n)
SDIO

4343W / 43438
SB 1x1 Wi-Fi 4 (11n) +
Bluetooth 5.1 SDIO/SPI

43439
SB 1x1 Wi-Fi 4 (11n) +
Bluetooth 5.1 SDIO/
SPI WPA3

43012
ULP DB 1x1 Wi-Fi 4 (11n) +
Bluetooth 5.1
SDIO/SPI WLBGA/WLCSP

43903
SB 1x1 Wi-Fi 4 (11n) +
160-MHz R4

43907
DB 1x1 Wi-Fi 4 (11n) +
320-MHz R4

Wi-Fi 5 (802.11ac)

43455
DB 1x1 Wi-Fi 5 (11ac) +
Bluetooth 5.0
SDIO

4373/E
DB 1x1 Wi-Fi 5 (11ac) +
Bluetooth 5.2
USB/SDIO/PCIe (4373E)
-40 to 85C (4373E)

4356
DB 2x2 W-Fi 5 (11ac) +
Bluetooth 5.0
PCIe/SDIO

54590
DB 2x2 Wi-Fi 5 (11ac) +
Bluetooth 5.1
PCIe/SDIO

54591
DB 2x2 Wi-Fi 5 (11ac), RSDB,
Bluetooth 5.1
PCIe/SDIO

54907
DB 1x1 Wi-Fi 5 (11ac) +
320-MHz R4

Wi-Fi 6 (802.11ax)

55571
TB 1x1 Wi-Fi 6E (11ax) + Bluetooth 5.2
PCIe/SDIO (Sampling)

55572
DB 2x2 Wi-Fi 6 (11ax) + Bluetooth 5.2
PCIe/SDIO (Sampling)

55573
TB 2x2 Wi-Fi 6E (11ax) + Bluetooth 5.2
PCIe/SDIO (Sampling)

Wi-Fi + Bluetooth® Combos
Infineon's AIROC™ Wi-Fi & combos for **Linux, Android** and **RTOS**

ModusToolbox™ Software and Tools provides code examples, tools and development support **for easier development and reduced time to market.**



Wi-Fi Connectivity Processor
High-performance and flexibility when connectivity must standalone

On-chip MCUs, memory, and networking protocols **reduce risk and ease integration** for cloud-connected applications.

Overview of Wi-Fi Combo Families and Key Features

Device Type/Features	Wi-Fi + Bluetooth® Combo Devices				
Device	**CYW43439**	**CYW43012**	**CYW4373/E**	**CYW5459x**	**CYW5557x**
Reason To Choose	Entry level	Ultra Low power	Reliable High Throughput	Peak Throughput	Wi-Fi 6/ 6E
Wi-Fi Version	Wi-Fi 4 (11n)	Wi-Fi 4 (11n)	Wi-Fi 5 (11ac)	Wi-Fi 5 (11ac)	Wi-Fi 6/ 6E (11ax)
Bluetooth® Version	5.1	5.0	5.2	5.1	5.2
Band	Single Band 2.4GHz	Dual Band 2.4GHz, 5GHz	Dual Band 2.4GHz + 5GHz	Dual Band 2.4GHz, 5GHz	Triple Band 2.4 + 5 + 6GHz
Streams	1x1	1x1	1x1 w/Ant Diversity	2x2 (MIMO)	2x2 (MIMO)
Wi-Fi Host Interface	SDIO – shared, SPI	SDIO	SDIO, SPI, PCIe (4373E), USB (shared)	PCIe, SDIO	PCIe, SDIO
Bluetooth® Host Interface	UART, SDIO - shared	UART	UART, USB (shared)	UART	UART
ePA/eLNA	**X**	√	√	**X**	**X**
WPA3	√	√	√	√	√
Operating Temperature	-30C to +70C	-20C to +70C	-40C to 85C (4373E)	-40C to 85C	-40C to 85C

- Broad family of products covering all bands / Wi-Fi 4, 5, up to 6E
- Rock solid connectivity – best of breed RF performance over 20+ years
- Easy Development – Modules available from multiple vendors
- Built on Innovation – Ultra-Low power, Coexistence, new use cases

Infineon AIROC™ Wi-Fi 6/6E improves user experience

Technical Issues Experienced with Wi-Fi

US Broadband households using Wi-Fi at home

Service Interruptions	35%
Slow Speed	30%
Coverage Problems	14%
Difficulty connecting via Wi-Fi	10%
Difficulty managing passwords	5%
Difficulty setting up security	5%

CYW5557x Benefits

Powering any use case

- Robust network
- High Throughput
- Low Latency
- Extended Range
- Key management
- Multi-Layered Security

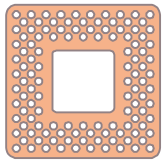


Source: parksassociates.com

Infineon AIROC™ Wi-Fi Ecosystem Partners

A global partner ecosystem enables support and development for your IoT application

Module Makers



Design, build and sell RF Modules with limited software and hardware certification support

- muRata — INNOVATOR IN ELECTRONICS
- USI
- AzureWave

Value-Added Resellers



Provide certified, ready-to-use modules with integrated software and custom services

- LANTRONIX®
- Laird™ CONNECTIVITY
- Inventek Systems — Embedding Connectivity Everywhere

ODMs



Integrate modules, software and plastics into a finished product with customization options

- Chicony
- FOXCONN
- PEGATRON

Software & Services



Wi-Fi Mesh, RF expertise, Wi-Fi Driver & Bluetooth®, camera software

- embedUR
- VIRSCIENT
- RHONDA
- Packet Path

Cloud Connectivity Manager Module

Turnkey Solution for Reliable & Secure IOT Connectivity

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Reliability

- **Most widely deployed wireless IP** - more than 1 Billion Wi-Fi and Bluetooth® Infineon devices in the field
- **User Experience - Best interoperability** with installed base of Access Points and phones sharing IP heritage
- **Infineon manages the wireless** – continuous improvement with latest Access Points



Secure

- **ARM PSA level 2 certified** secure MCU
- **Secure Enclave** for key storage
- **Cloud ID provisioning -** option for late binding to cloud
- Runs IFX **signed image only**

Turnkey Solution

- Cloud connection requires **special competencies: wireless, networking, security**
- **No product differentiation** unless done poorly
- **Standalone module is** best for products not designed with connectivity in mind – no redesign for systems with limited CPU and memory resources
- **Simple AT Command Configuration** from host for Wi-Fi and cloud – no need for driver integration onto host CPU
- **Over-the-air update capability** built-in

Introducing Cloud Connectivity Manager (CCM) Module

Plug & Play -- No Coding required

Online in minutes

Secure & reliable



Quick & Easy

- **Online in 15 mins**
- **No software development** or maintenance needed
- **Simple AT Command Set** configuration

Secure

- Only runs **Infineon signed software** & upgraded via Over The Air updates (OTA)
- **Secure enclave** to store certificates & root of trust
- ARM **PSA Certified Level 2**
- Cloud ID for **secure and easy provisioning** & manufacturing

Deploy with Confidence

- **20 years of experience** in Wi-Fi connectivity
- **Pre-tested & pre-certified**
- **Best interoperability** with installed base of access points with shared IP heritage
- Cirrent Wi-Fi **onboarding app** improves customer experience

CCM Module Specs

- Wi-Fi 4: 1x1 802.11N
- Serial interface to Host
- Dimensions: 36mm(L) x 18mm(W) x 2.8mm(H)
- FCC certified

- **Available: June ’22**
- Lead customers: Now

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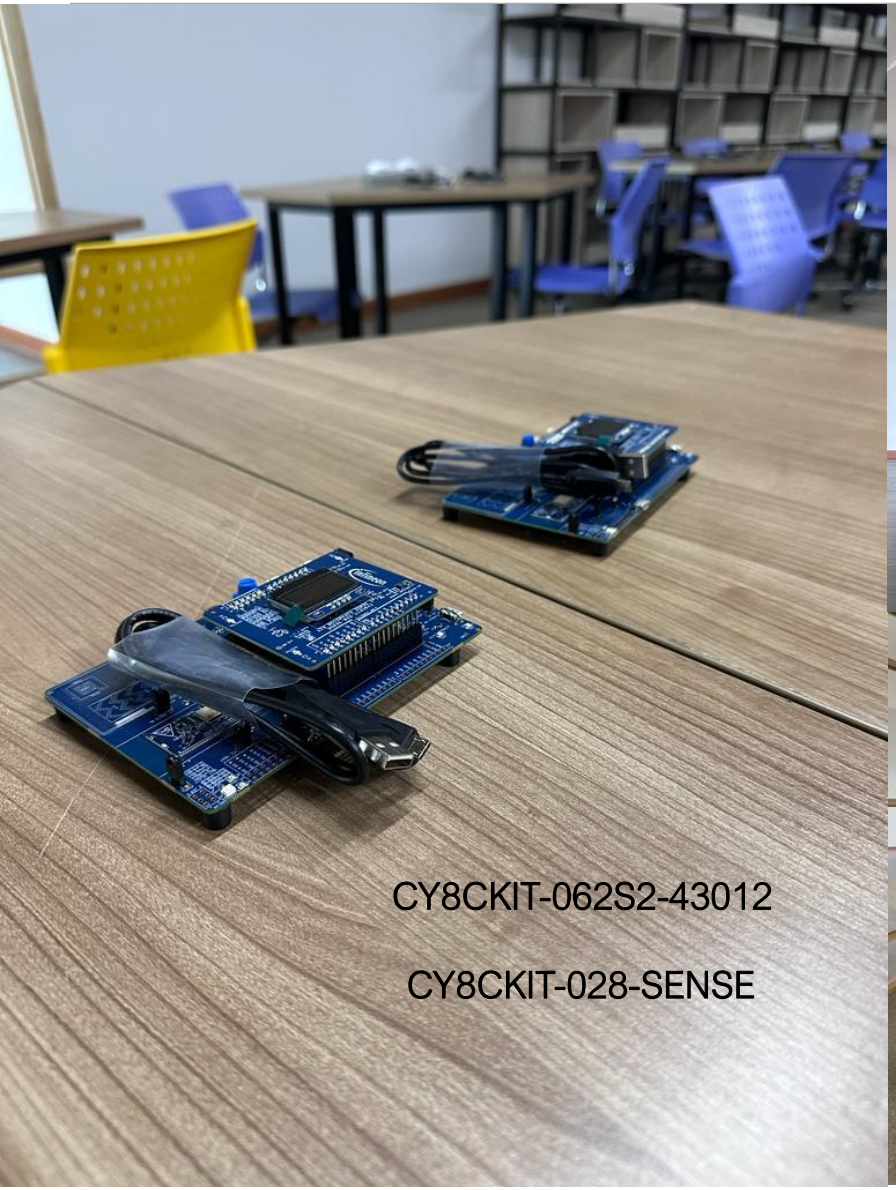
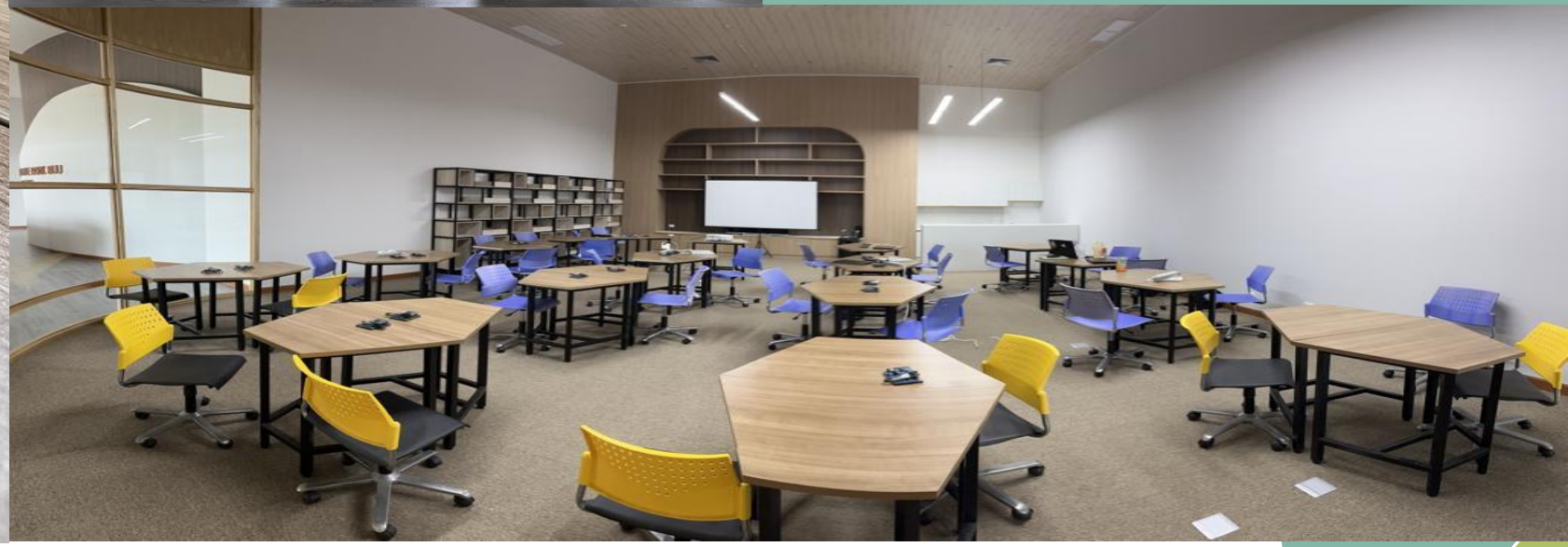
BUU x Infineon IoT Lab

BUU x Infineon IoT Lab





PSoC6, Ultra Low Power Microcontroller Built for IoT Workshop



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PSoC6 Workshop



CY8CKIT-062S2-43012



CY8CKIT-028-SENSE

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Part of your life. Part of tomorrow.