Mobile Robots: Connectivity (Wi-Fi, BLE)

AGV – Automated Guided Vehicles
AMR – Automated Mobile Robots

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Application Manager Robotics

2022 Edition

Infineon is a globally leading semiconductor player

* over the cycle 9%+ revenue growth; 19% Segment Result margin; investment-to-sales ratio of 13%;
targets to be approached as integration progresses

top 10

› semiconductor company

~46,700

› total employees

~7,800

› R&D employees

leading player

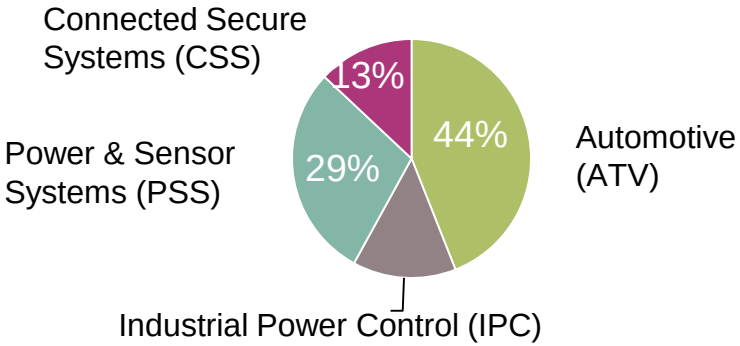
› in automotive, systems for power management and drives, sensor systems, connected secure systems, wireless combos, differentiated memories

9%+ I 19% I 13%

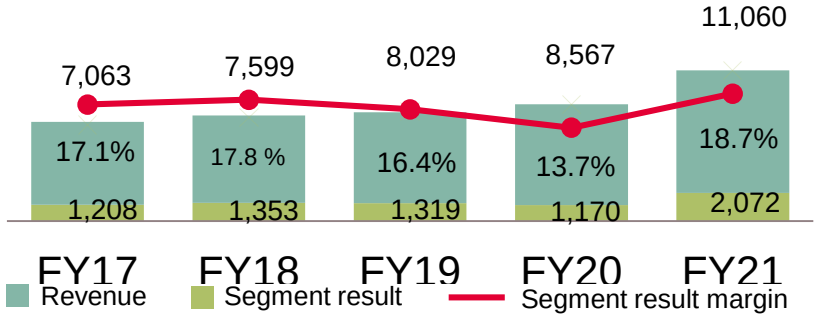
› target operating model*

Infineon at a glance

Business segments revenue*



Financials

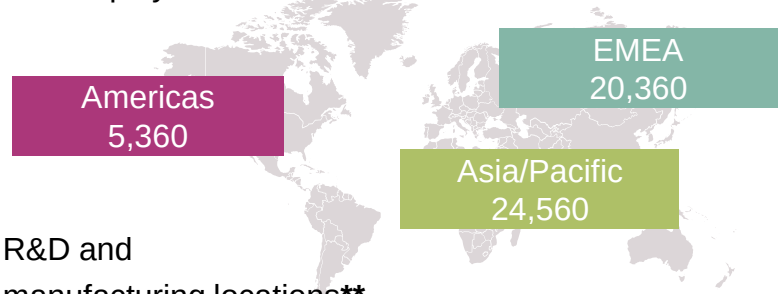


*2021 Fiscal year (as of 30 September 2021)

**as of 30 September 2021

Employees*

50,280 employees worldwide



56 R&D and

20 manufacturing locations**

Market position

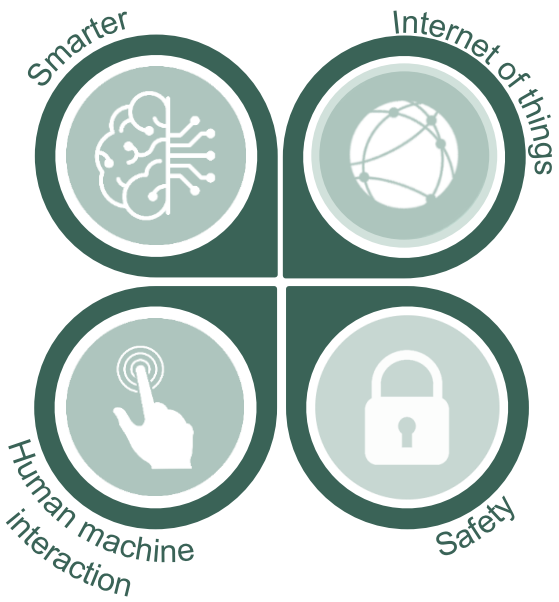
Automotive	Power	Microcontroller
		
# 1	**# 1**	**# 3**
Strategy Analytics, April 2021	Omdia, September 2021	Omdia, August 2021

For further information: Infineon Annual Report 2021

Main trends and challenges in robot applications

Robots are moving toward Industry 4.0. This brings the need for robots to be smarter and interconnected but also calls for the need for standardization.

Human-robot collaboration is one important trend in robotics. The ability to work mutually with humans, enables robots to adapt to a rapidly changing environment.



Connectivity level and the need of data security correlate, so security must be integrated into all existing and new systems, but once again calls standardization needs for diverse robots & systems to interact properly.

Safety is key when robots interact with their environment with a special focus on human safety, work safety, routing accuracy and collision avoidance

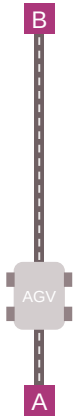
Types and deployment of mobile robots

On high level mobile robots can be categories into AGVs and AMRs

AGV

Automated Guided Vehicle

AGVs are “fixed”. They follow predefined paths using lasers, beacons, barcodes or magnetic tape.



AMR

Autonomous Mobile Robot

AMRs are not “fixed” and don’t need external paths. Autonomously mapping and navigating by using sensors

Potential use cases: warehouse & logistic, last mile delivery, robots in hotels, banks, airports etc.

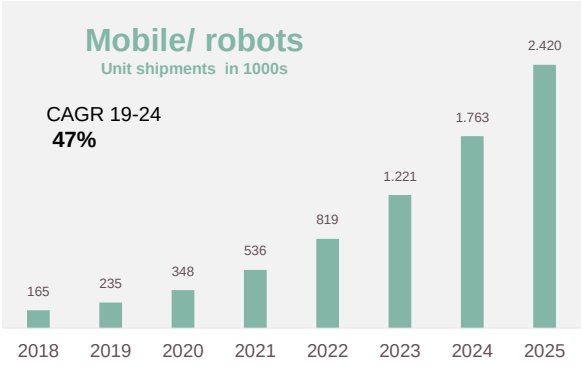
Mobile robots are a fast growing market and need sophisticated system solutions for each functional block

Application requirements

Different types of mobile robots require unique and appropriate solutions

- **Precise, efficient & compact motor drives**
- **Fast charging reducing charging and idle time**
- **Environmental sensing for navigation and safety**
- **Connectivity enabling AI, real time monitoring and IoT**
- **Connectivity enabling AI and IoT**

Market outlook



Source: ABI Research 2020

Connectivity

Back to overview

Connect what matter! Stable and secure connectivity with Wi-Fi and BLE

Connectivity

- Wi-Fi
- BLE
- Combo solutions (Wi-FI & BLE)

Infineon leading IoT Compute & Wireless solutions

Category Leading Products

- Delivering compute, Wi-Fi, Bluetooth, and HMI products
- Flexible, secure, low-power MCU family
- Low-power, robust Wi-Fi and Bluetooth optimized for IoT
- Rich, easy-to-use software

Longstanding IoT Leader

- Growing PSoC MCU family since 2002
- Acquired market-leading Broadcom IoT business in 2016 then more than doubled the business
- Key IoT-focused driver of Wi-Fi Alliance and Bluetooth SIG

Trusted Partner

- Compelling roadmap focused on the IoT
- Proven track record of commitment and quality
- Core supplier to 8 of top 10 IoT companies

Bluetooth & Wi-Fi selection guide

Wireless Connectivity

Our robust portfolio of Bluetooth/BLE & Wi-Fi connectivity enable a host of different functionalities within Service Robots addressing multiple markets

	Recommendation
Long-range connectivity	CYW20820, CYW20735, CYW20706
HMI (capacitive-sensing)	PSoC 6 BLE, PSoC 4 BLE
Ultra-low-power operation	CYW20819, PSoC 6 BLE
Sensor fusion/analytics	PSoC 6 BLE, PSoC 4 BLE
Simple BLE processor	CYW20704, CYW20736
Dual Mode Bluetooth and BLE	CYW20820, CYW20735, CYW20706

	Recommendation
Highest Throughput/Best Range	CYW4373, CYW43439
Dual Band (2.4GHz and 5GHz)	CYW4373
Single Band (2.4 GHz)	CYW43439
Bus Interface (USB, SDIO, PCiE)	USB:CYW4373, PCIe: CYW4373E, SDIO: all
SISO (1x1) antenna configuration	CYW4373, CYW43439
MIMO (2x2) antenna configuration	CYW54590

Infineon Wi-Fi:
Unique capabilities that deliver powerful Wi-Fi for the IoT

RELIABLE

- More than 1 Billion Wi-Fi devices in the field
- High-performance RF design provides longer range (more than double some competitors) and better interference rejection
- More than 1 Billion events captured from devices in the field to improve reliability
- Continuous improvement of in-field robustness to improve performance, reduce support calls and boost sales

LOW POWER

- Ultra low power – very low sleep, transmit, and receive current
- High-performance RF ensures the most robust connection, which substantially reduces power consumption
- Continuous improvements to battery life via a unique visibility into real-world power consumption

SECURE

- Most widely vetted Wi-Fi chips in the market, with security researchers extensively focused on Cypress Wi-Fi
- Deep domain knowledge and processes to help partners and customers secure products throughout the lifecycle
- Securing more than 50% of credit cards and 40% of digital passports

Wi-Fi Product Portfolio

Wi-Fi 4 (802.11n)

43364
SB 1x1 11n
SDIO

4343W/43438
SB 1x1 11n + BT5.1
SDIO/SPI

43439
SB 1x1 11n + BT5.2
SDIO/SPI

43012
ULP DB 1x1 11n + BT5.2
SDIO/SPI WLBGA/WLCSP

43903
SB 1x1 11n + 160-MHz R4

43907
1x1 DB 11n + 320-MHz R4

Wi-Fi 5 (802.11ac)

43455
DB 1x1 11ac + BT5.0
SDIO/SPI

4373 / 4373E
DB 1x1 11ac + BT5.2
USB/SDIO/PCIe

54590
DB 2x2 11ac + BT 5.1
PCIe/SDIO

54591
DB 2x2 11ac, RSDB, BT5.1
PCIe/SDIO

54907
1x1ac DB + 320-MHz R4

Wi-Fi 6 (802.11ax)

5557x
TB, WI-Fi 6E, 2x2 + BT5.2
PCIe/SDIO

Coming in 2022:

1x1ax DB + BT

Wi-Fi + Bluetooth Combos

Infineon's Wi-Fi and Bluetooth combos use production-ready, fully-certified Wi-Fi + Bluetooth combo modules based on both Linux and RTOS based platforms. Many of the Wi-Fi + Bluetooth combos are supported on Infineon's WICED Wi-Fi and ModusToolbox Software Development Kits (SDK) which provide code examples, tools and development support **for easier and faster development.**

Wi-Fi

Infineon's Wi-Fi portfolio provides high-performance, flexible connectivity for Linux, Android, and RTOS. Many of the Wi-Fi + Bluetooth combos are supported on Infineon's WICED Wi-Fi and ModusToolbox Software Development Kits (SDK) which provide code examples, tools and development support.

Infineon Wi-Fi Ecosystem Partners

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

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

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

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

Module Makers

muRata
INNOVATOR IN ELECTRONICS

USI

AzureWave

Value-Added Resellers

LANTRONIX

Laird

Inventek Systems
Embedding Connectivity Everywhere

ODMs

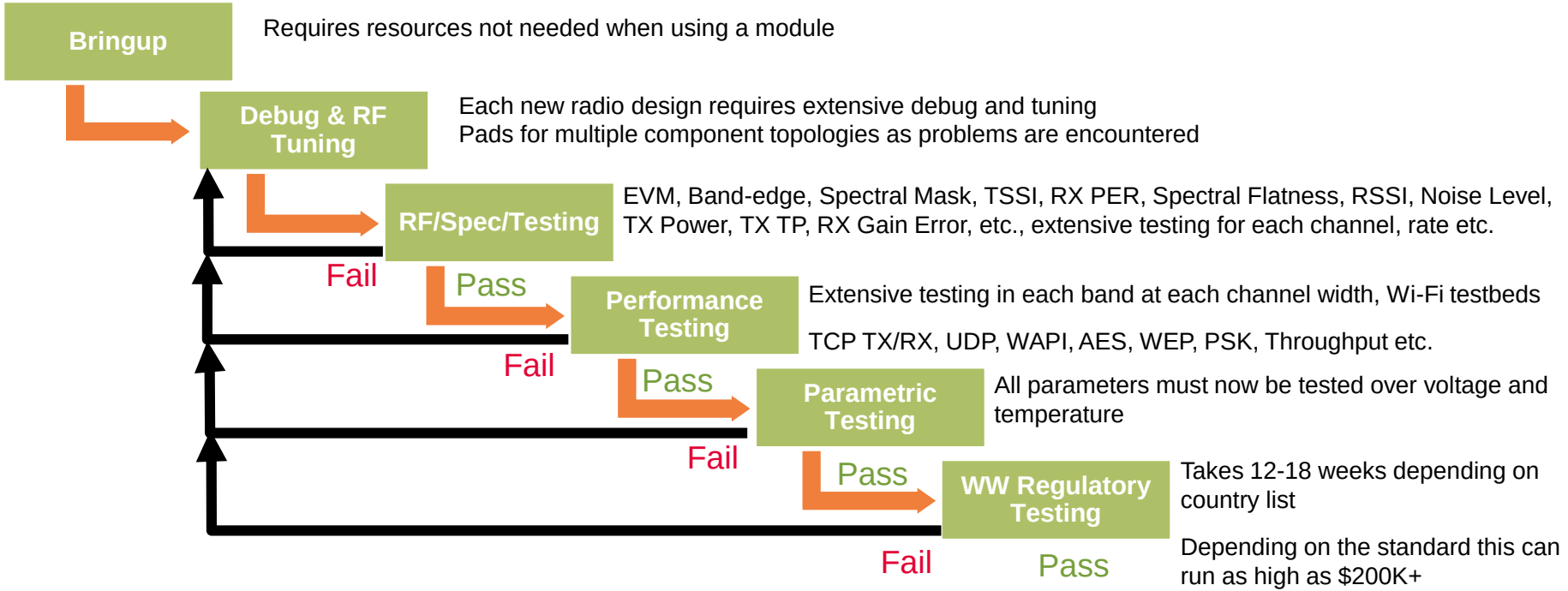
Chicony

FOXCONN

PEGATRON

Minimize complexity and improve time-to-market with certified modules

Simplified WLAN RF Design Flow

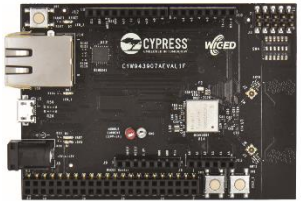


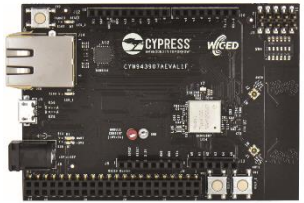
AIROC™ Wi-Fi and Bluetooth® Combo Development Kits

Infineon offers an array of Wi-Fi enabled Dev Kits to kickstart your IoT application.

Wi-Fi Connectivity Processor Dev Kits

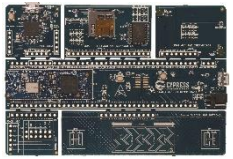
Dev Kits for Infineon single-chip Wi-Fi only SoCs with integrated applications processor





PSoC™ 6 Wi-Fi MCU Pioneer/Prototyping Kits

Dev Kits for Infineon PSoC™ 6 as host MCU for Wi-Fi Combo radios



Infineon Wireless Module Partner Dev Kits

Dev Kits created by Infineon Wireless Module Partners hosting our Wi-Fi Combo radios

Bluetooth Product Portfolio

32-Bit Arm Cortex M0 or Cortex-M3	32-Bit Arm Cortex-M4	32-Bit Arm Dual Core Cortex-Mx

Today
World's most widely deployed Bluetooth IP & Stack.
BT- Classic and BLE combo with Low power Consumption

20706
BT5.2/BLE CM3 SoC
10 dBm Tx, Audio

20736/7
BLE-5.2 CM3 SoC
4 dBm Tx

PSoC 4 BLE
BLE-4.2/5.1
CM0 SoC w/ flash
3 dBm Tx

20719
BT5.1/BLE CM4 SoC
1M Flash/512K
5dBm Tx, Mesh

20721
BT5.1/BLE CM4 SoC
1M Flash/512K
5 dBm Tx, Audio

20819/20820
BT5.2/BLE CM4 SoC
256K/176K, Mesh
4dBm/10dBm Tx

20735
BT5.0/BLE CM4 SoC
10 dBm Tx, Mesh

20835
BLE-5.2 CM4 SoC
10 dBm Tx, Mesh

20830
BLE-5.2 2xCM33, HADM
512K/224K, Mesh
10 dBm

20829
BLE-5.2 2xCM33, HADM
0K/224K, Mesh
10 dBm

CQ321
CQ222

PSoC 6 BLE
BLE-5.2 CM4 & CM0+ SoC
Up to 1M Flash/288K
4 dBm Tx

20831
BT/BLE5.2, 2xCM33
0/1024K, Audio
11 dBm Tx, HADM

20809
BLE-5.2 2xCM33 HADM
0K/32K
10 dBm TX, Thin HCI

Tomorrow

BT 5.2 optimized for low power, Form factor and best in class feature support

Faster Throughput : 2Mbps LE enables Faster FW updates

Advt. Extension: Enables additional services via more application data

LE Long Range: Low duty cycle tethering or asset tracking

AoA/AoD + HADM: Rich application using accurate location data

Isochronous Channels: Enable audio over BLE in addition to EDR

Bluetooth Module Portfolio

	Standard	Size	External Antenna	Extended Range	Extended Temp
PSoC6 CM4 & CM0+ SoC, 2Mbps PHY Single Mode BLE 5.0, CapSense	CYBLE-416045-02 1MB Flash, 2Mbps BLE, 36 GPIOs 14 x 18.5 x 2.00 mm SMT				
20719/20721 CM4 SoC Dual Mode BT 5.0 2Mbps PHY	Mesh EZ-S CYBT-413055-02 1MB Flash, 17 GPIOs, 12 x 16.3 x 1.70 mm SMT Mesh EZ-S CYBT-413061-02 1MB Flash, 17 GPIOs Audio 12 x 16.3 x 1.70 mm SMT	Mesh EZ-S CYBT-423054-02 1MB Flash, 17 GPIOs 11 x 11 x 1.70 mm SMT Mesh EZ-S CYBT-423060-02 1MB Flash, 17 GPIOs Audio 11 x 11 x 1.70 mm SMT		Mesh EZ-S CYBT-483056-02 1MB FlashPA/LNA(20 dBm) , 15 GPIOs, 12.75 x 18.59 x 1.8 mm SMT Mesh EZ-S CYBT-483062-02 1MB Flash, PA/LNA(20 dBm) , 15 GPIOs, Audio 12.75 x 18.59 x 1.8 mm SMT	
20820 CM4 SoC Dual Mode BT 5.0 2Mbps PHY	Mesh CYBT-243053-02 256KB Flash, 22 GPIOs, +10dBm TX, 12 x 16.61 x 1.70 mm SMT External 512 KB SFLASH needed to support MESH	Mesh CYBT-253059-02 256KB Flash, 22 GPIOs, +10dBm TX, 11 x 11 x 1.70 mm SMT External 512 KB SFLASH needed to support MESH			Mesh CYBT-243068-02 512KB SFlash, 22 GPIOs, +10dBm TX, 12 x 16.61 x 1.70 mm SMT
20819 CM4 SoC Dual Mode BT 5.0 2Mbps PHY	Mesh CYBT-213043-02 256KB Flash, 22 GPIOs, 12 x 16.61 x 1.70 mm SMT External 512 KB SFLASH needed to support MESH	Mesh CYBT-223058-02 256KB Flash, 22 GPIOs 11 x 11 x 1.70 mm SMT External 512 KB SFLASH needed to support MESH	Mesh CYBT-2630xx-02 256KB Flash, PA/LNA (20 dBm), Ext. Antenna via RF Pad or u.FL 20 GPIOs 12.5 x 19 x 1.95 mm SMT External 512 KB SFLASH needed to support MESH	Mesh CYBT-273063-02 256KB Flash, PA/LNA (20 dBm) 20 GPIOs 12.5 x 19 x 1.95 mm SMT External 512 KB SFLASH needed to support MESH	
20735 CM4 SoC 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				
20706/20707 CM3 SoC Dual Mode BT 5.0	Mesh EZ-S CYBT-343026-01 512KB SFlash, 11 GPIOs. +10dBm TX, Audio 12 x 15.5 x 1.95 mm SMT	Mesh EZ-S CYBT-353027-02 512KB SFlash , 8 GPIOs, +10dBm TX, Audio 9 x 9 x 1.75 mm SMT	Mesh EZ-S CYBT-3330xx-02 512KB SFlash, LMA[3] , 11 GPIOs +10dBm TX, Ext. Antenna via RF Pad or u.FL Audio 12 x 12 x 1.95 mm SMT		Mesh EZ-S CYBT-343151-02 512KB SFlash, 11 GPIOs, +10dBm TX, Audio 12 x 15.5 x 1.95 mm SMT
20737 CM3 SoC BLE 4.1 Low Cost	EZ-S CYBLE-0130xx-00 128KB/0KB SFlash, 16/18 GPIOs 14 x 19 x 2.25 mm SMT				
PSoC4 CM0 SoC Single Mode BLE 4.2/5.1 CapSense	EZ-S CYBLE-x120xx-0x **128/256KB Flash, 23 GPIOs** **14 x 19 x 2.00 mm SMT**	EZ-S CYBLE-x220xx-0x **128/256KB Flash, 16 GPIOs** **10 x 10 x 1.80 mm SMT** EZ-S CYBLE-x140xx-0x **PSoC 4 BLE, 128/256KB Flash,** **Opamp, CMP, 4 UDBs, 25 GPIOs** **11 x 11 x 1.70 mm SMT**	EZ-S CYBLE-2020xx-01 **256 KB Flash, PA/LNA (20 dBm),** **Ext. Antenna via RF Pad or u.FL,** **19 GPIOs** **15 x 23 x 2.05/1.55 mm SMT**	EZ-S CYBLE-212006-01 **256 KB Flash, PA/LNA** **PCB Antenna, 19 GPIOs** **15 x 23 x 2.00 mm SMT**	EZ-S CYBLE-22411x-0x 256 KB Flash, PA/LNA (+20 dBm) Opamp, CMP[6], 4 UDB[7], 25 GPIOs 9.5 x 15.4 x 1.80 mm SMT

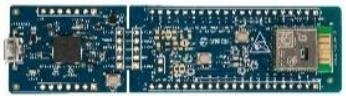
AIROC™ Bluetooth® and Bluetooth® LE Development Kits

Bluetooth/Bluetooth LE SoC Silicon

Arduino Eval Kits

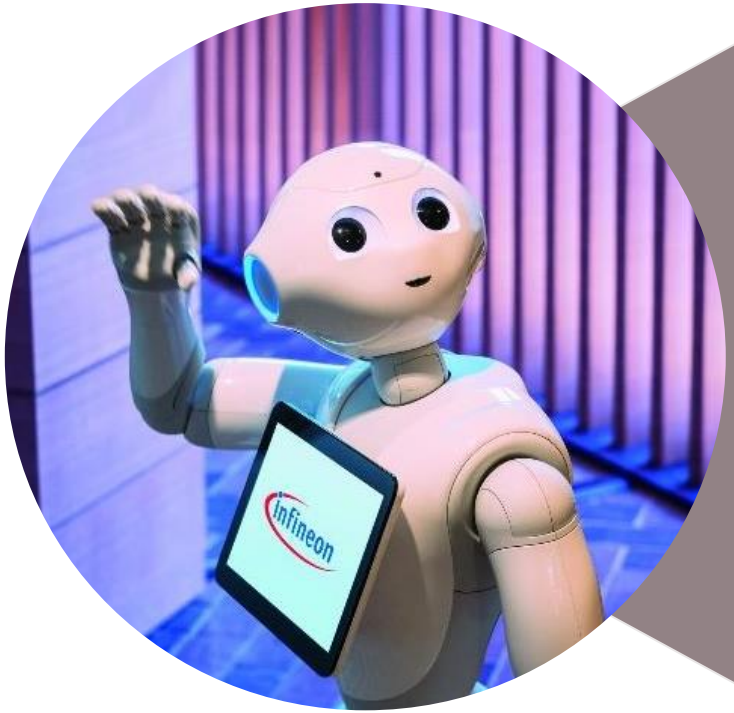


PSoC 6 Bluetooth LE and PSoC 4 Bluetooth LE Dev Kits



Bluetooth/Bluetooth LE Module Eval Kits


Further Material – Connectivity



Portfolio and further information can be found here:

- Link ➔ Combo (Wi-Fi & BLE)
- Link ➔ Wi-Fi
- Link ➔ BLE

Part of your life. Part of tomorrow.