



# Smartwatch, sports watch, wristband, and medical wrist-worn devices

Infineon's solutions for wrist-worn devices that enable secure  
data transmission and high use experience



Bring your wearables to the next level with Infineon's sensing, RF, power, power, connectivity and security solutions

Infineon is a power semiconductor leader for IoT devices. With our broad product solutions and portfolio, you can solve design challenges such as data security, sensor accuracy, connectivity, device protection, all while enabling best in class power consumption and IC form factor.

Interested? Learn more at:  
[www.infineon.com/wearables](http://www.infineon.com/wearables)



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# Emerging trends and drivers shaping the wearables and healthtech market

Nowadays, wearables technology is making the leap from activity trackers to holistic full-body monitoring devices which consist of an array of advanced biometric sensors. Sensor accuracy is of great importance for wearables as health companions. As manufacturers aim to provide more and more actionable data in health and fitness tracking for consumers, there is a strong trend to improve the sensor accuracy and provide completely new vital sign monitoring sensors. Advanced health monitoring such as blood pressure, body temperature, blood glucose or other complex vital signs are required due to growing interest in personal healthcare by consumers. Moreover, the collected health data must be kept private and be treated very cautiously. Thus data security and privacy need to be considered as crucial element. Low power consumption of components is essential to enable extension of battery lifetime. New form factors and body positions beyond the wrist are investigated and a diversification of wearable offerings will shape the market in the future.

## Key market trends and drivers



### Sensor accuracy

increase required to improve health and fitness monitoring and boost value to consumers



### Power consumption and management

are key to boost battery lifetime (energy harvesting, low power semiconductors) and increase charging convenience



### Smartphone autonomy

Wearables are moving from companion devices to standalone consumer devices

### Data security and privacy

gaining importance as health-related data requires protection



### Bluetooth® audio streaming

to wireless earbuds while exercising sports and increase in autonomy from smartphone



### Fuse between health and consumer

Advanced health monitoring for prediction/prevention  
New: contact tracing and social distance enforcement



# Wearable devices

Wearable devices have become a reality and a part of every day life. Wearables can be comfortably worn on a body and are used for multiple purposes depending on the application. Wearers of smartwatch, sports watch, wristband, and medical wrist-worn devices can control many functions such as messages, phone calls, notifications on their smartphones from the wrist. Moreover, they can monitor their health and track their daily activities.



## Smartwatch

A smartwatch is a wrist-worn wearable device that provides a two-way connection to a smartphone via Bluetooth® and/or cellular baseband or Wi-Fi to the cloud. It receives electronic communications like texts or voice calls, also showing the time and other alerts on its glanceable display. In addition, these convenient lifestyle devices support health, fitness and activity tracking.



## Sports watch

A sports watch is a highly functional, robust and usually water-resistant device. It is typically used by leisure and professional athletes to monitor health metrics, fitness and sleep patterns. Sports watches have fewer features than smartwatches, with the main design focus on sports tracking.



## Wristband / Fitness band

A wristband or fitness tracker is a wrist-worn device tailored to activity-tracking and health-monitoring functions. Designs can vary from a simple pedometer for step counting to more sophisticated use cases such as sleep monitoring, location tracking and access control.



## Medical wrist-worn device

A medical wrist-worn device measures physical activity and general health stats such as fall detection, blood pressure, heart rate or glucose monitoring for diabetes patients. Such connected health devices have passed tests by regulatory authorities and enable elderly people in particular to live independently and safely.

*“Infineon’s RF, sensor, connectivity, power, memory and security solutions bring your wrist-worn device to the next level”*





## Smartwatch

A smartwatch is a wrist-worn device that offers a feature-set that goes far beyond what is found in traditional watches but comes with expectations of a similar form factor. Smartwatch provides an interactive display for viewing notifications such as emails, messages, to-do lists, navigation, reminders, and phone calls. Smartwatch provides sensor information such as heart rate, temperature, barometric pressure, distance traveled and location. This lifestyle device monitors health and makes communication (text, calls) more convenient.

Choose Infineon to meet your application requirements

### Use cases



**Notifications**



**Voice recording and assistant**



**Location tracking**



**Information visualization**  
(maps, news, videos, etc.)



**Physical condition monitoring**  
(sleep, heart rate, etc.)



**Gesture control**



**Fitness monitoring**



**Physical condition monitoring**  
(cardiac condition, blood pressure, blood glucose)



**Bluetooth® audio streaming**



**More mobile network access and smartphone autonomy**



**Contactless payment,  
access control and ticketing**

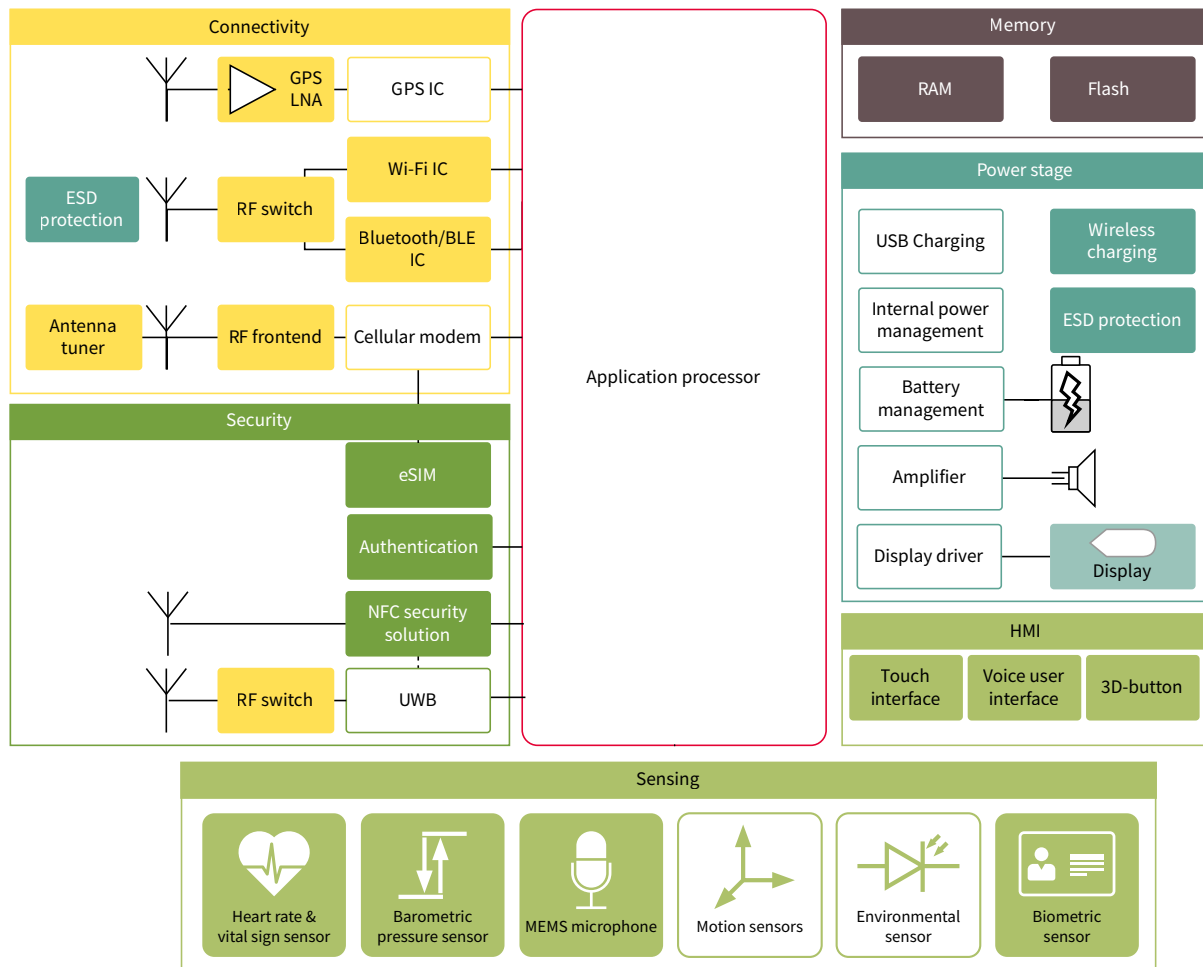


**Car access control**

● Use cases today

● Future use cases

# Smartwatch block diagram



## Sensing

- > XENSIV™ pressure sensor DPS310 / DPS368
- > XENSIV™ MEMS microphone IM69D120/D130
- > Innovation: XENSIV™ 60GHz radar and XENSIV™ multigas sensor

## Power stage

- > ESD protection ESD119-B1/ESD111-B1/ ESD307-U1
- > Wireless charging (on demand)

## Memory

- > F-RAM
- > Low-power NOR flash

## Security

- > OPTIGA™ Connect eSIM solution OC1120
- > SECORA™ Connect (boosted SiP, passive NFC, boosted MCP)
- > OPTIGA™ Authenticate IDoT SLE95401/5402/5405
- > RF switches for UWB

## Human machine interface

- > XENSIV™ MEMS microphone IM69D120/D130
- > XENSIV™ 3D-magnetic sensor TLI493-W2BW AO
- > PSoC™ 4 incl. CAPSENSE™ CY8C4024/CY8C4125
- > PSoC™ 6 incl. CAPSENSE™ CY8C68237FM-BLE

## Connectivity

- > GPS LNAs: L1 frequency BGA123L4, BGA524N6, BGA123N6 and L2/L5 frequency BGA125N6
- > RF switches for Wi-Fi and cellular RF frontend BGS12WN6/BGS13SN8/ BGS14WMA9
- > Antenna tuners BGSA12UGL8 (smallest size) or BGSA143GL10 (unwanted resonance stopper)
- > LTE LNAs BGA5x1BN6 family
- > AIROC™ Wi-Fi ICs CYW43362/CYW43364
- > AIROC™ BT/Wi-Fi CYW43012
- > AIROC™ Bluetooth® LE SoC for audio CYW20719/CYW20721





## Sports watch

A sports watch adds new possibilities to improve sports and enables wearers to reach enhanced athletic and fitness performances. This device highly relies on accurate sensing and precise monitoring of the athlete's actions and body's function. This wrist-worn device is commonly water-resistant and includes features such as an alarm, stopwatch, compass, heart rate monitor, tachymeter, thermometer, and other components which boost sport experience.

Choose Infineon to meet your application requirements

### Use cases



**Notifications**



**Location tracking**



**Sleep monitoring**



**Speed monitoring**



**Bluetooth® audio streaming**



**Contactless payment, access control  
and ticketing**



**Activity tracking**



**Information visualization**  
(maps, news, videos, etc.)



**Body temperature monitoring**



**Heart rate monitoring**



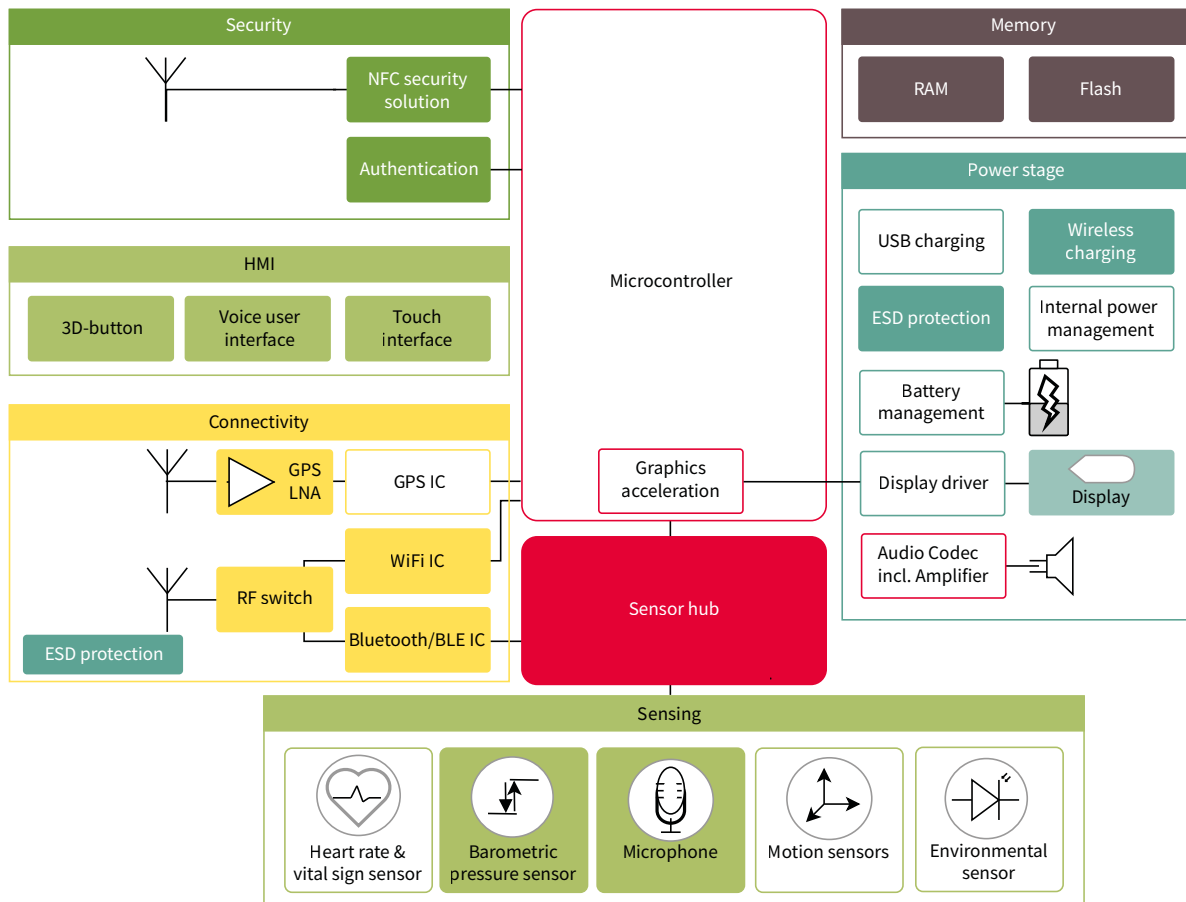
**Physical condition monitoring**  
(cardiac condition, blood pressure, blood  
glucose)



**Car access control**

● Use cases today  
● Future use cases

# Sports watch block diagram



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- > AIROC™ BT/Wi-Fi CYW43012
- > AIROC™ Bluetooth® LE and Bluetooth® SoC for audio CYW20719/CYW20721

## Sensor Hub

- > PSoC™ 6 family - PSoC™ 63 dual-core M4/M0-MCU + BLE + CAPSENSE™
- > AIROC™ Bluetooth® LE and Bluetooth® SoC for audio CYW20719/CYW20721



## Wristband / Fitness band

A fitness tracker is a band which is built for monitoring and data gathering about the wearers body activities and vital signs. The fitness band relays data to a smartphone, while smartwatch and sports watch include additional communication features and other applications which are non-essential for wearers of wristband and fitness band.

Wristband or fitness band is a device that enables some combination of walking steps, running distance, heartbeat, sleep monitoring, calorie consumption and other functions / sensors which are necessary for wearers who want to track fitness-related metrics.

Choose Infineon to meet your application requirements

### Use cases



**Notifications**



**Physical condition monitoring**  
(sleep, heart rate, fall detection, etc.)



**Location tracking**



**Contactless payment, access control and ticketing**



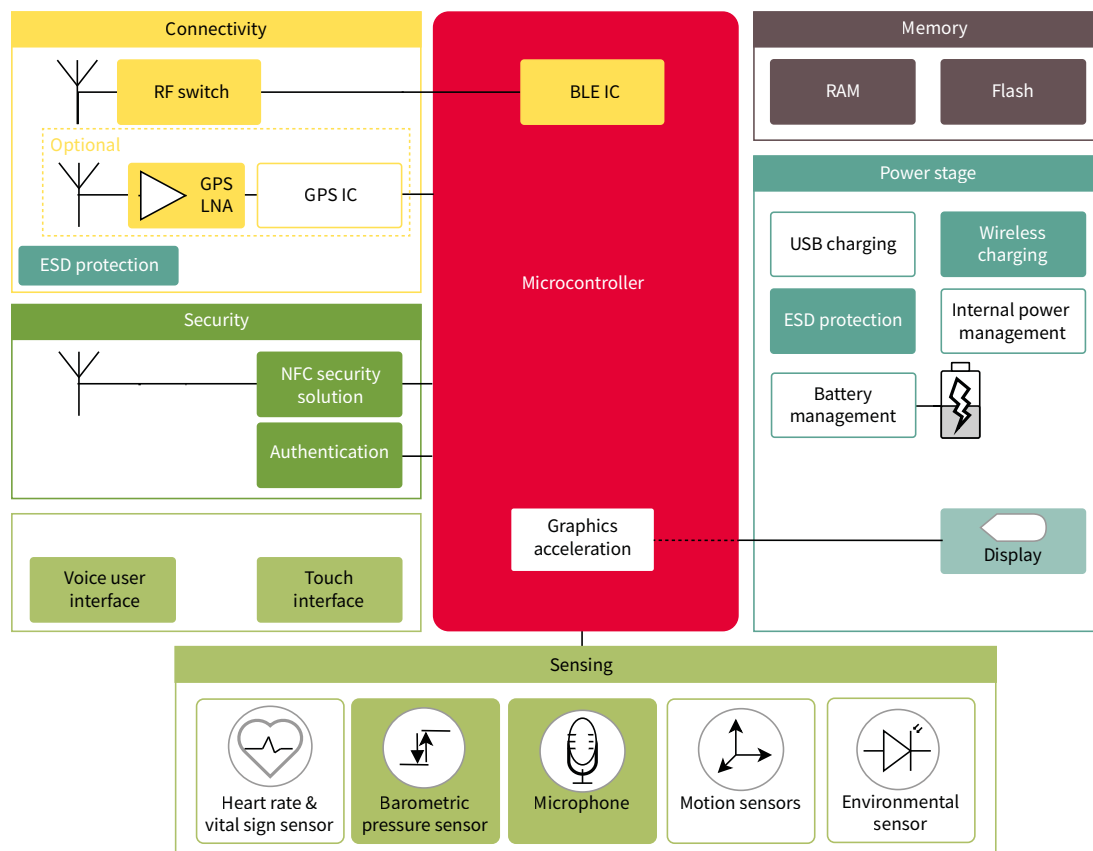
**Fitness monitoring**



**Activity tracking**  
(step counting, calories burned, sedentary alarms, etc.)

● Use cases today  
● Future use cases

# Wristband / Fitness band block diagram



<b>Sensing</b> <ul style="list-style-type: none"> <li>&gt; XENSIV™ pressure sensor DPS310/DPS368</li> <li>&gt; XENSIV™ MEMS microphone IM69D120/D130</li> </ul>	<b>Power stage</b> <ul style="list-style-type: none"> <li>&gt; ESD Protection ESD119-B1/ESD111-B1/ ESD307-U1</li> <li>&gt; Wireless charging (on demand)</li> </ul>	<b>Memory</b> <ul style="list-style-type: none"> <li>&gt; F-RAM</li> <li>&gt; Low-power NOR flash</li> </ul>
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## Medical wrist-worn device

A medical wrist-worn device is a health band which provides clinically relevant information about a wearer. It monitors and analyses medical conditions which are crucial for clients who need to check-up their vital signs regularly. This medical wrist-worn device is used for elderly care, safety, connectivity and other health-related tracking purposes for patients, sometimes even prescribed by physicians.

Choose Infineon to meet your application requirements

### Use cases



**Notifications**



**Location tracking**

(GPS included or linked to smartphone)



**Fitness monitoring**



**Sleep monitoring**



**Advanced physical condition monitoring**

(cardiac condition, blood pressure, blood glucose)



**Physical condition monitoring**

(sleep, heart rate, fall detection, etc.)



**Body temperature monitoring**



**Cloud authentication for safe data transfer or data privacy**

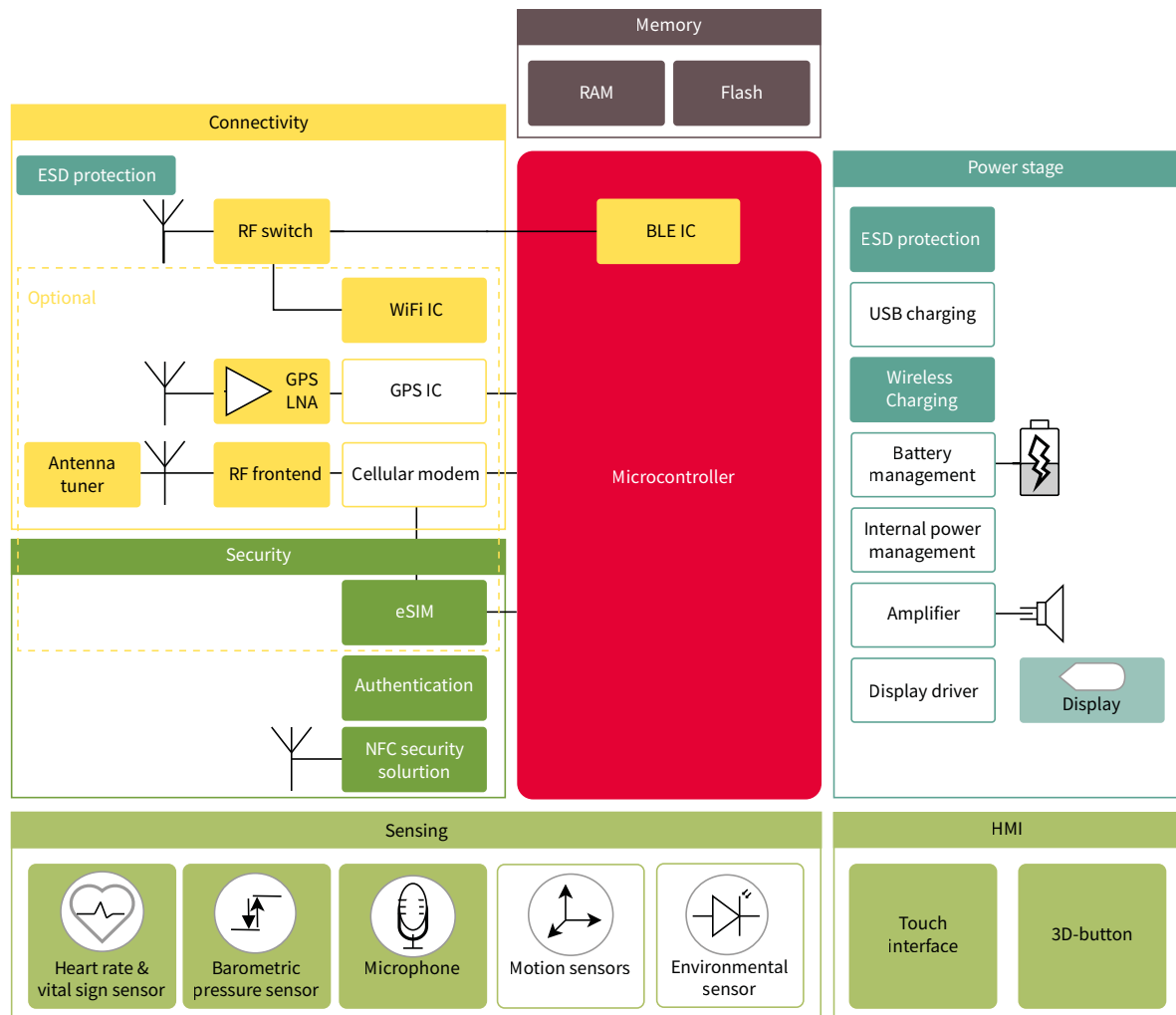


**Heart rate monitoring**

● Use cases today

● Future use cases

# Medical wrist-worn device block diagram



## Sensing

- > XENSIV™ pressure sensor DPS310/DPS368
- > XENSIV™ MEMS microphone IM69D120/D130
- > Innovation: XENSIV™ 60 GHz radar (coming soon)

## Power stage

- > ESD Protection ESD119-B1/ESD111-B1/ESD307-U1
- > Wireless charging (on demand)

## Memory

- > F-RAM
- > Low-power NOR flash

## Security

- > OPTIGA™ Connect eSIM solution OC1120
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## Human machine interface

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- > PSoC™ 6 family - PSoC™ 63 dual-core M4/M0-MCU + BLE + CAPSENSE™

[www.infineon/medical-wrist-worn](http://www.infineon/medical-wrist-worn)



## Infineon's offering for wearables

- › XENSIV™ 3D magnetic sensor
- › XENSIV™ 60 GHz radar sensor
- › XENSIV™ pressure sensor
- › XENSIV™ MEMS microphones
- › XENSIV™ Multigas sensor
- › Wireless charging
- › AIROC™ Wi-Fi and Combos
- › AIROC™ Wi-Fi
- › AIROC™ Bluetooth® LE and Bluetooth®
- › AIROC™ Bluetooth® 5.0 SOC for audio
- › Wi-Fi MCUs
- › Secora™ Connect
- › PSoC™ 6 Microcontrollers
- › PSoC™ 4 Microcontrollers
- › PSoC™ 4 Bluetooth® Low Energy (Bluetooth® Smart)
- › PSoC™ including CAPSENSE™ technology
- › RF switches
- › OPTIGA™ Connect Consumer eSIM solution
- › OPTIGA™ Authenticate IDoT
- › NOR Flash / F-RAM
- › GPS LNA
- › ESD protection
- › Antenna tuners
- › 4G / 5G LTE LNAs

[www.infineon.com/wearables](http://www.infineon.com/wearables)



For more details on the product,  
click on the product



## Highlight products for sensing

Use cases



Voice calls



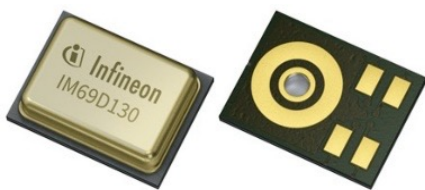
Voice assistant activation

### XENSIV™ MEMS microphones

The popularity of voice user interfaces and the usage of audio recording to share information and experiences are increasing dramatically. Infineon XENSIV™ MEMS microphones introduce a new performance class that overcomes existing audio chain limitations.

#### XENSIV™ MEMS microphone IM69D130

**IM69D130** is a high performance digital MEMS microphone making use of Infineon's Dual Backplate MEMS technology to deliver 105 dB dynamic range and high output linearity up to 130 dBSPL. The application benefits are crystal clear audio signals, extended pick-up distance and sensitivity to both soft and loud signals - from whispered speech to rock concerts.



#### Key features

- > 69 dB(A) signal-to-noise ratio
- > Below 1 percent distortions at 128 dBSPL (AOP - 130 dBSPL)
- > Digital (PDM) interface with 6  $\mu$ s group delay at 1 kHz
- > Tight sensitivity ( $-36 \pm 1$  dB) and phase ( $\pm 2$  deg) tolerances
- > 28 Hz low frequency roll-off

#### Infineon inside MEMS microphone partners

You can rely on our global network of Infineon inside MEMS microphone partners to find the perfect fit for your target application from our extensive portfolio. For more details on our MEMS microphone partner solutions, please click [here](#).







## Highlight products for sensing

Use cases



Altimeter



Activity tracking  
and fall detection



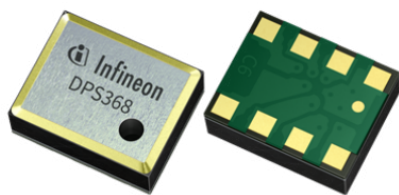
Location tracking and  
weather forecast

### XENSIV™ pressure sensors

Infineon XENSIV™ sensors are exceptionally precise thanks to industry-leading technologies. Our XENSIV™ family of digital absolute barometric pressure sensors gives designers the best choice when it comes to wearable devices. Highlights include small form factors to facilitate system integration, highest precision and relative accuracy over a wide temperature range, fast-read out speed via the serial I<sub>2</sub>C/SPI interface, and low power consumption to ensure longer battery lifetimes.

#### XENSIV™ DPS368

Infineon XENSIV™ DPS368 is a miniaturized digital barometric air pressure sensor with ultra-high precision ( $\pm 2$  cm) and a low current consumption, capable of measuring both pressure and temperature. Due to its robust package, it can withstand 50 m under water for one hour (IP x 8). The pressure sensor element is based on a capacitive sensing principle which guarantees high precision during temperature changes. The small package (2.0 x 2.5 x 1.1 mm<sup>3</sup>) makes the DPS368 ideal for wearable devices.





#### Key features

- > Package dimensions: 8-pin LGA, 2.0 x 2.5 x 1.1 mm<sup>3</sup>
- > Operation range:  
Pressure: 300–1200 hPa and  
Temperature: -40–85°C
- > Precision:  $\pm 0.002$  hPa (or  $\pm 0.02$  m)
- > Rel. accuracy:  $\pm 0.06$  hPa (or  $\pm 0.5$  m)
- > Abs. accuracy:  $\pm 1$  hPa (or  $\pm 8$  m)
- > Temperature accuracy:  $\pm 0.5^\circ\text{C}$
- > Avg. current consumption:  
1.7  $\mu\text{A}$  (pressure measurement)  
@1Hz sampling rate,  
standby: 0.5  $\mu\text{A}$
- > Integrated FIFO
- > Interface: I<sub>2</sub>C and SPI (both with optional interrupt)

#### Infineon inside pressure sensor partners

Explore our Infineon inside pressure sensor partner products to find the ideal product for your next target application. Simply click on the partner link and browse through our partner offerings at Infineon website. For more details on our pressure sensor partners, please click [here](#).



Image	Board	Family	Description
	<a href="#">EVAL SHNBV01 DPS368</a>	Sensor	Infineon Sensor Hub Nano DPS368
	<a href="#">S2GO PRESSURE DPS368</a>	Sensor	Shield2Go equipped with XENSIV™ barometric pressure sensor DPS368

# Highlight products for sensing

## Use cases



Altimeter



Activity tracking  
and fall detection



Location tracking and  
weather forecast

## XENSIV™ DPS310

Infineon's **XENSIV™ DPS310** is a miniaturized digital barometric air pressure sensor with a high accuracy level and low current consumption. The DPS310 is both a pressure and temperature sensor. The pressure sensor element is based on a capacitive principle which guarantees high precision during temperature changes. The small package makes the DPS310 ideal for mobile applications and wearable devices.



### Key features

- > Supply voltage range 1.7 V to 3.6 V
- > Operation range  
300 hPa – 1200 hPa
- > Sensor's precision 0.002 hPa
- > Relative accuracy  $\pm 0.06$  hPa
- > Pressure temperature sensitivity  
of 0.5 Pa/K
- > Temperature accuracy  $\pm 0.5^\circ\text{C}$

## Use cases



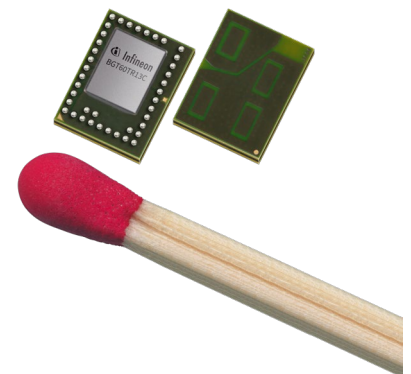
Advanced vital sensing



Gesture control

## XENSIV™ 60 GHz radar MMICs

Infineon's highly integrated **XENSIV™ 60 GHz** radar sensor solutions bring innovative, intuitive sensing capabilities to many applications. Our high-end XENSIV™ 60 GHz sensor has one transmitting and one receiving antenna and all our 60 GHz radar sensors are optimized in size and come with antennas in package. With its FMCW operation mode spanning a ultrawide bandwidth of 5.5 GHz, it allows to detect micro motions in the mm range. This enables advanced radar sensing including presence detection, tracking, vital sensing and gesture control.



### Key features

- > Radar transmits through materials  
and can be hidden under a case
- > 7 GHz wide bandwidth enables  
submillimeter resolution to recog-  
nize even tiniest movements
- > Integrated antenna in package  
enable small form factor system  
designs

# Highlight products for HMI

## Use cases



## Touch HMI

### 32-bit Arm® Cortex®-M0 PSoC™ 4

**PSoC™ 4** has tackled some of the complex portions of embedded system design making it easier for you to get your product to market. 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 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.



#### Sense anything

Programmable analog and digital blocks in PSoC™ 4 enable you to customize your analog-front-end, apply simple glue logic and easily integrate intelligent analog sensors into an application



#### Intelligent sensor integration

#### Easy-to-use HMI

PSoC™ 4 simplifies complex HMI interfaces such as capacitive and inductive sensing enabling sleek, robust, and easy-to-use interfaces



#### Capacitive and inductive sensing

#### Connected

Bluetooth® Low Energy (BLE) integrated into some PSoC™ 4 devices simplifies RF design. Additional wired interfaces such as USB and CAN are also available



#### Wired and wireless connectivity

### PSoC™ 4000 Entry-level MCUs

**PSoC™ 4000** and **PSoC™ 4000S** are cost-optimized, entry-level PSoC™ 4 devices with an Arm® Cortex®-M0 and M0+ cores. PSoC™ 4 provides 32-bit performance along with PSoC™ value added features such as **CAPSENSE™** and flexible peripherals to an evolving market.



#### PSoC™ 4000 Family Features

- › 32-bit MCU subsystem
- › Arm® Cortex®-M0 and Arm Cortex-M0+ Cores
- › Up to 48 MHz CPU speed
- › Up to 32 kB Flash, 4 kB SRAM
- › Real-time clock with Watch Crystal Oscillator (WCO)
- › Programmable Analog Blocks
- › Up to 10-bit, 11.6 Ksps ADC
- › Up to 2 low power comparators
- › CAPSENSE™ block supporting mutual-capacitance sensing
- › Programmable Digital Blocks
- › Up to 5 Timer/Counter/PWM blocks
- › Up to 2 Serial Configuration Blocks (SCBs)
- › I/O Subsystem
- › Up to 36 GPIO

# Highlight products for HMI

## Use cases



3D button, digital crown



Other position sensing

## XENSIV™ 3D magnetic sensor

XENSIV™ 3D magnetic sensor TLI493D-W2BW combines high-accuracy magnetic field measurements with an extremely compact footprint and exceptionally low power consumption (min. 7 nA). This sensor enables contactless position sensing for three-dimensional magnetic movements. Our 3D sensor is a hall-based sensor which detects the strength of a magnetic field in all three dimensions (e.g., x-, y- and z-axis). In addition, the sensor is widely used to sense linear magnetic as well as angular movements. TLI493D-W2BW is available in 4 different variants ending with A0, A1, A2, or A3.



### Key features

- > Ultra low power concept
- > Low energy consumption
- > Accurate 3D magnetic measurement
- > Tiny WLB package  
1.13 x 0.93 x 0.59 mm
- > Wake-up function

For more details on our 3D magnetic sensor product portfolio, please click [here](#)

XENSIV™ pocket product guide, please click [here](#)



# Highlight products for security

## Use cases



Cellular connectivity



Smartphone autonomy

## OPTIGA™ Connect Consumer eSIM solution

This 5G-ready eSIM turnkey solution securely authenticates the device to the subscribed carrier network of choice. It is a ready-to-connect embedded SIM (eSIM) solution for mobile consumer devices. It is especially suited to extending cellular connectivity to smaller devices like smart watches, fitness trackers and other wearables.



### Key features

- > Ultra-small package  
2.9 x 2.5 x 0.4 mm
- > Huge memory space
- > Latest SIM profile
- > Latest Remote SIM Provisioning
- > All mobile network technologies

Explore more about our OPTIGA™ Connect eSIM security solutions, please click [here](#)





# Highlight products for security



## SECORA™ Connect family

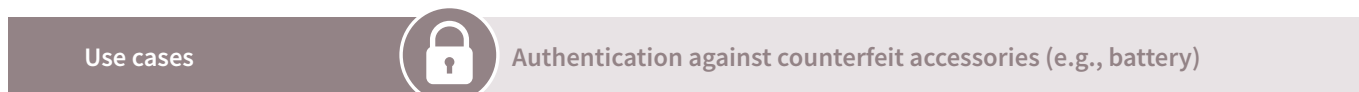
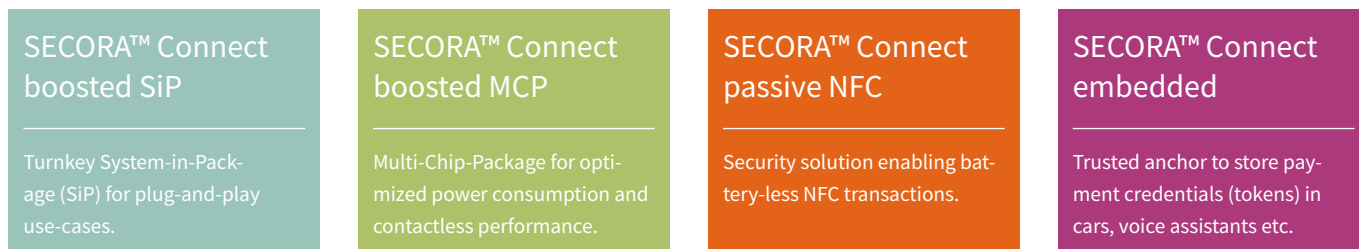
**SECORA™ Connect** family empowers smart wearables with NFC security capabilities. When equipped with NFC capabilities, a wearable device can allow you to pay at a store, access a mass transport system or your own office building.

SECORA™ Connect is a complete turnkey solution that enables the user to securely provision, store, select and use multiple credentials such as payment card, transport ticket, etc., turning the de-facto wearable or IoT device into a powerful and versatile wallet. SECORA™ Connect allows smart wearables system designers with no security or antenna design experience to seamlessly integrate a very compact, ultra-low power consuming solution for various NFC based applications.

### Key features

- > Turnkey and cost optimized NFC
- > Fast time to market
- > Ultra-low power consumption
- > Design flexibility with optimized PCB footprint
- > Seamless integration
- > Scalability
- > Cost-/Space-optimized

## Product portfolio



## OPTIGA™ Authenticate IDoT (Identity of Things)

Best-in-class, anti-counterfeit turnkey solution, combining enhanced device authentication with unprecedented levels of configuration flexibility

Explore more about our OPTIGA™ Authenticate IDoT (Identity of Things), please click [here](#)



### Benefits

- > Protection of OEMs and consumers against counterfeited devices
- > Turnkey solution with full system integration support including embedded software, host software, visualization (VIZ) tool for easy assessment, full reference board based upon PSoC™ 6 with demo software and full documentation
- > Tiny and robust TSNP SMD package (1.5 mm x 1.5 mm x 0.38 mm) optimized for small devices





# Highlight products for device protection

Use cases

 Device protection

## ESD and Surge Protection

System level ESD protection becomes more important and more difficult with each new generation of electronics. New and emerging applications require ever more capable protection solutions. Infineon leads with a strong and growing family of ESD protection devices with better clamping, lower capacitance, and a wide range of operating voltages. On top of this, Infineon’s Chip Scale Package (CSP) focus supports both high quality levels and high production volume support at extremely competitive pricing.

**Multi-purpose interfaces**

- › Ultra low clamping voltage for high protection level
- › Low leakage current for battery saving

**High-speed interfaces**

- › Ultra low clamping voltage for high protection level
- › Ultra low capacity for best signal immunity

**RF and NFC antennas:**


- › Ultra low capacity for best signal immunity
- › High linearity devices

Charging		High-speed interfaces	
Functionality	IFX components	Functionality	IFX components
› Surge protection	<ul style="list-style-type: none"><li>› ESD307-U1-02N</li><li>› ESD311-U1-02N</li></ul>	› ESD protection	<ul style="list-style-type: none"><li>› ESD119-B1-W01005</li><li>› ESD130-B1-W0201</li><li>› ESD131-B1-W0201</li><li>› ESD133-B1-W01005</li></ul>



RF and NFC interfaces		Multi-purpose interfaces	
Functionality	IFX components	Functionality	IFX components
› ESD protection	<ul style="list-style-type: none"><li>› ESD119-B1-W01005</li><li>› ESD128-B1-W0201</li><li>› ESD129-B1-W01005</li><li>› ESD130-B1-W0201</li><li>› ESD131-B1-W0201</li><li>› ESD133-B1-W01005</li><li>› ESD144-B1-W0201</li></ul>	› ESD protection	<ul style="list-style-type: none"><li>› ESD202-B1-CSP01005</li><li>› ESD230-B1-W0201</li><li>› ESD231-B1-W0201</li><li>› ESD233-B1-W0201</li><li>› ESD237-B1-W0201</li><li>› ESD239-B1-W0201</li><li>› ESD241-B1-W0201</li><li>› ESD242-B1-W01005</li><li>› ESD245-B1-W0201</li><li>› ESD246-B1-W01005</li><li>› ESD249-B1-W0201</li></ul>

Explore more products [here](#)





# Highlight products for connectivity

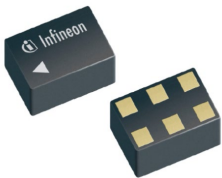
Use cases

Location tracking

## GPS LNA

GPS/GLONASS/COMPASS navigation devices, be it personal navigation device (PND), mobile phone or tablet or watch or camera, require a low noise amplifier to enhance receiver sensitivity for best localization even under bad conditions.

Most of the wearables today feature navigation and location tracking applications. These impose great demands on linearity, size and power consumption of [GPS LNA](#). Emerging dual-frequency (L1 and L2/L5) architectures can also be covered with the Infineon portfolio at lowest power consumption.



- Key features:
- > Fast single pick-up and accurate location tracking
  - > Space-saving integration into device
  - > Increased battery lifetime for location tracking
  - > Small size
  - > High performance

## Product portfolio

Low power	Part Number	Band	Gain (dB)	NF (dB)	I <sub>cc</sub> (mA)	V <sub>cc</sub> (mA)	IIP3	Size (mm <sup>2</sup> )
	BGA123N6	L1	18.8	0.75	1.35	1.1 – 3.3	-12	1.1 x 0.7
	BGA125N6	L2/L5	20.0	0.80	1.35	1.1 – 3.3	-14	1.1 x 0.7
	BGA123L4	L1 L2/L5	17.5 16.3	0.75 0.90	1.1	1.1 – 3.6	-14 -17	0.7 x 0.7
	BGA524N6	L1 L2/L5	19.5 18.2	0.65 0.70	2.5	1.5 – 3.3	-9 -11	1.1 x 0.7

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**Learn more about:**  
 BGA123N6, BGA125N6 - Ultra-low power GPS LNA for wearables

# Highlight products for connectivity

## Use cases



## Cellular connectivity



## Smartphone autonomy

### RF switches

Infineon offers a wide range of RF switches for wireless communication systems like cellular 4G/5G, Wi-Fi and UWB. The variety of throwcount types, allows customers to target many IoT/5G applications like smartphones, wearables, smart home devices and more. Infineon RF switches are commonly controlled via GPIO (General Purpose Input/Output) or via the standardized MIPI RFFE (Mobile Industry Processor Interface for RF Front-End) Interface.

#### Key features

- › Improve signal quality and coverage
- › Reliable supplier meeting customer requirements
- › Increased battery lifetime for cellular connected wearables
- › Flexible package variants
- › High performance

### 4G/5G LNAs

Infineon 4G/5G LNA MMICs (Monolithic Microwave Integrated Circuit) are designed to optimize the sensitivity of mobile cellular systems. This allows to extend the area of highest data traffic also distant from the next base station and enables highest network efficiency by reduced transmission power and lowest bit error rates.

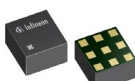
#### Key features

- › Ultra-low NF
- › High linearity and low current consumption that enhances the signal receiving sensitivity and improves data transfer rate
- › Smallest package in the industry
- › Increased system integration and reduce the product power consumption

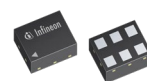
## Product portfolio - Selected highlight products



**BGS12WN6** 0.7 x 1.1 mm<sup>2</sup>  
(TSNP-6-2)



**BGS13SN8** 0.7 x 1.1 mm<sup>2</sup>  
(ATSLP-9-50)



**BGA5x1BN6 family** 0.7 x 1.1 mm<sup>2</sup>  
(TSNP-6-2)

#### Wideband RF switches BGS12WN6 and BGS13SN8 (for 5G and Wi-Fi and Bluetooth®)

<ul style="list-style-type: none"> <li>› Sub-6 GHz 5G support</li> <li>› Fastest switching speed 100 ns for Wi-Fi</li> <li>› Lowest supply voltage support (~1.65 V)</li> <li>› General purpose multi-market SPDT/SP4T, Wi-Fi Tx / Rx switching, IoT devices / smart applications</li> </ul>	f [GHz]	0.1 – 5.9
	BGS12WN6	0.1 – 5.9
	IL [dB]	0.16; 0.22; 0.46
	BGS12WN6	0.22; 0.28; 0.65
	ISO [dB]	46; 37; 28
	BGS12WN6	48; 35; 30
	BGS13SN8	

#### 2<sup>nd</sup> generation of high gain bypass LTE LNAs BGA5x1BN6 family

<ul style="list-style-type: none"> <li>› Multi-state control: bypass- and high gain-mode</li> <li>› Insertion Loss in bypass mode: 2.5 (L)/0.5 (M)/0.6 (H) dB</li> <li>› Self shielding included</li> <li>› Supply voltage: 1.5 V to 3.6 V</li> <li>› RF input and output internally matched to 50</li> </ul>	f [GHz]	0.6 – 1.0 1.8 – 2.2 2.3 – 2.7
	Gain [dB]	18 ; 18 ; 18.5
	NF [dB]	0.6 ; 0.7 ; 0.8
	Icc [mA]	9.2 ; 7.2 ; 7.2



# Highlight products for connectivity

Use cases



Cellular connectivity



Smartphone autonomy



Location tracking

## Antenna Centric Solutions (IASC)

Infineon's antenna centric solutions allow a significant improvement in data rate of mobile cellular devices while minimizing power consumption. Modern 4G/5G devices have to cover a wide frequency range while each of the multi-bands antennas has to be minimized in dimensions.

Infineon antenna centric devices optimize the antenna performance in the required frequency bands so as to improve the reception of weak signals and radiate efficiency. Hence it indirectly lowers its current consumption from power amplifiers.



**BGSA12UGL8**  
1.1 x 1.1 mm<sup>2</sup>  
(TSLP-8)



**BGSA14GN10**  
1.5 x 1.1 mm<sup>2</sup>  
(TSNP-10)

### Key features

- > Improved signal quality and coverage
- > Smallest form factor designs due to industrial design flexibility
- > Increased battery lifetime for cellular connected wearables
- > Less system current consumption (PA) through optimized antenna performance

## Product portfolio - Selected highlight products

BGSA12UGL8		
> 1.1 x 1.1 mm <sup>2</sup> package, smallest SPDT on the market	f [GHz]	0.1 – 6.0
> Designed for high-linearity antenna tuning	R <sub>on</sub> [Ω]	0.6
> GPIO control	C <sub>off</sub> [fF]	270
> Low harmonic generation		
> 1.8 V VDD support (1.65 V min)	V <sub>RFmax</sub> [V]	40

BGSA14GN10		
> High-linearity SP4T for antenna aperture switching applications	f [GHz]	0.1 – 6.0
> 2 GPIO (4 states)	R <sub>on</sub> [Ω]	1.6
> Low harmonic generation		
> 1.8 V VDD support (1.65V min)	C <sub>off</sub> [fF]	120
> Suitable for EDGE/C2K/LTE/WCDMA applications	V <sub>RFmax</sub> [V]	36



RF solutions for the connected world

Pocket Guide 2021



[www.infineon.com/RF](http://www.infineon.com/RF)



Are you looking for additional products?

RF solutions for the connected world – explore more products in our [pocket guide online](#).





## Highlight products for connectivity

### Use cases



### Wi-Fi connectivity

#### AIROC™ Wi-Fi and Combos

WICED Wi-Fi + Bluetooth® combos integrate IEEE 802.11a/b/g/n/ac WLAN and Bluetooth® in a single-chip solution to enable small-form-factor IoT designs. Combo solutions are available for both 1 x 1 SISO with up to 433 Mbps PHY data rates and 2 x 2 MIMO with up to 867 Mbps PHY data rates.

These solutions can be coupled with external MCUs from Cypress and others for RTOS, along with Linux on applications processors to implement a complete Wi-Fi + Bluetooth® system.



#### Key features

- > High interoperability
- > Longer range and more stable connections
- > Easy to tune selection for best price/performance
- > Easy to integrate into CPU and MCU-based host systems
- > Wide selection of 3rd-party module options and integration support

Family	CYW43012	CYW43455	CYW4373E	CYW4339	CYW4356
Wi-Fi specification	802.11 a/b/g/n/ac	802.11 a/b/g/n/ac	0.75	-12	1.1 x 0.7
Bluetooth® specification	Bluetooth® 5.0	Bluetooth® 5.0	Bluetooth® 5.0	Bluetooth® 4.2	Bluetooth® 5.0
Interfaces	SDIO 3.0/2.0, SPI for Wi-Fi and I2C/PCM audio, HCI-over UART for Bluetooth®	SDIO 3.0/2.0, SPI for Wi-Fi and I2C/PCM audio, HCI-over UART for Bluetooth®	SDIO 3.0/2.0, SPI for Wi-Fi and I2C/PCM audio, HCI-over UART for Bluetooth®, USB 2.0 Hub shared between WLAN and Bluetooth®, PCIe v3.0 compatible	SDIO v3.0/2.0, SPI for Wi-Fi and HCI-over-USB2.0/UART, I2S/PCM audio for Bluetooth®	PCIe v3.0 compatible, SDIO v3.0/2.0 for Wi-Fi and HCI-over-USB 2.0/UART, I2S/PCM audio for Bluetooth®

Family	CYW43340	CYW4343W	CYW43438
Wi-Fi specification	802.11 a/b/g/n	802.11 a/b/g/n	802.11 a/b/g/n
Bluetooth® specification	Bluetooth® 5.0	Bluetooth® 5.1	Bluetooth® 5.1
Interfaces	SDIO v2.0, gSPI, HSIC for Wi-Fi and HCI-over-UART, 2 PCM/I2S audio for Bluetooth®, I2S/Stereo analog for FM	SDIO v2.0, gSPI for Wi-Fi and HCI-over-UART, 2 PCM/I2S audio for Bluetooth®, PCM/I2S/Stereo analog for FM	SDIO v2.0, gSPI for Wi-Fi and HCI-over-UART, 2 PCM/I2S audio for Bluetooth®, PCM/Stereo analog or FM

# Highlight products for connectivity

## Use cases



## BT connectivity



## BT audio streaming

## AIROC™ Bluetooth® LE and Bluetooth®

The [CYW20719](#) is a Bluetooth® 5.1-compliant, stand-alone baseband processor with an integrated 2.4 GHz transceiver with Bluetooth® LE, EDR and BR. The device is intended for use in audio, IoT, sensors (medical, home, security, and so forth) and human interface device (HID) applications.

### Bluetooth® v5.0, BR/EDR + Enhanced data rate + Bluetooth® Low Energy

- › Industry's most widely deployed Bluetooth® stack
- › Industry's lowest-power radio
- › Rx – 5.9 mA
- › Tx – 5.6 mA @ 0 dBm
- › 2-Mbps BLE support
- › Secure over-the-air (OTA) firmware upgrade
- › ECDH, AES

### MCU Subsystem

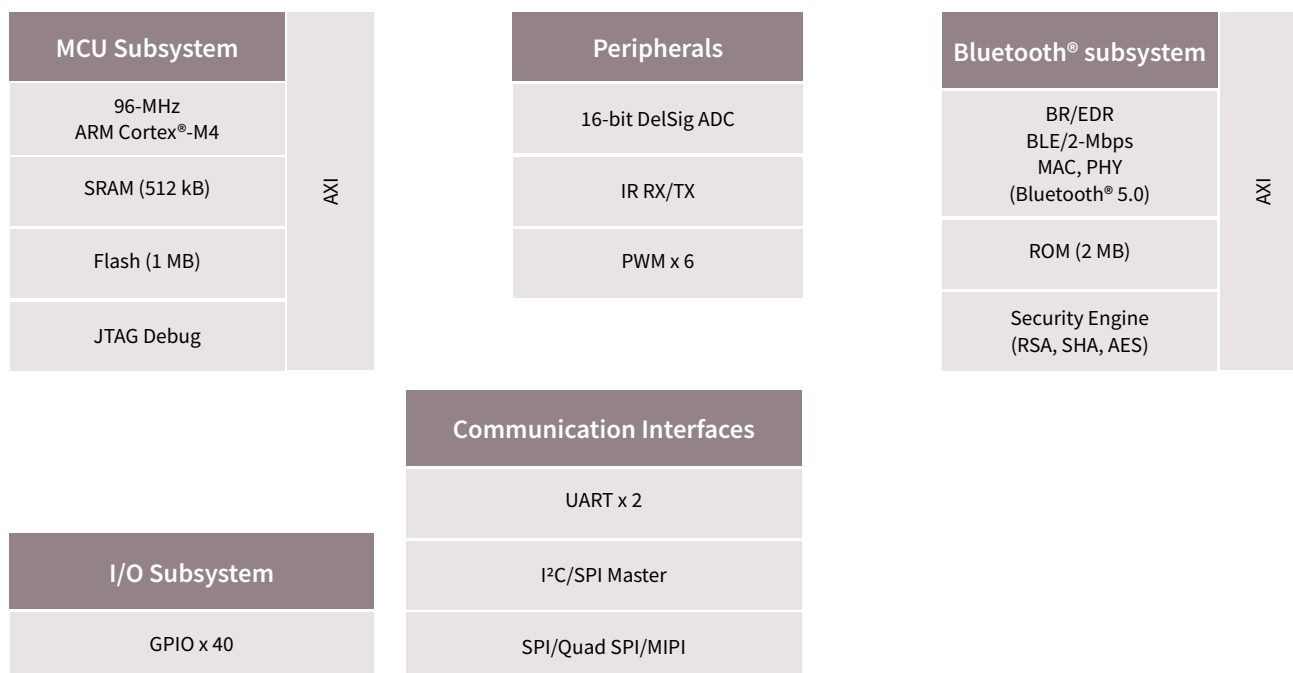
- › 96-MHz Arm® Cortex®-M4
- › 512 kB SRAM, 1 MB Flash, 2 MB ROM for stack and drivers

### Packages

- › 40-pin QFN (5 x 5 mm)
- › 134 ball WLCSP (3.2 x 3.1 mm)
- › Modules from Cypress and Partners

### Supported in ModusToolbox™ and Bluetooth® SDK

#### AIROC™ Bluetooth® LE & Bluetooth® CYW20719





#### CYW920719B2Q40EVB-01 Evaluation Kit

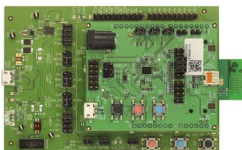
The Evaluation Kit enables you to evaluate and develop single-chip Bluetooth® applications using the CYW20719, an ultra-low-power dual-mode Bluetooth® 5.0 wireless MCU device.

##### Kit features

- > 40-QFN CYW20719 Bluetooth® 5.0-compliant BT/BLE wireless MCU
- > Arduino compatible headers for hardware expansion
- > On-board sensors: 9-axis motion sensor (3D digital linear acceleration sensor, 3D digital angular rate sensor, and 3D digital magnetic sensor) and a thermistor
- > User switches and LEDs
- > USB connector for power, programming and USB-UART bridge

## AIROC™ Bluetooth® LE and Bluetooth® CYW20721

The CYW20721 is a Bluetooth® 5.1-compliant, stand-alone baseband processor with an integrated 2.4 GHz transceiver with Bluetooth® LE, EDR and BR. The device is intended for use in audio, IoT, sensors (medical, home, security, and so forth) and human interface device (HID) applications. Manufactured using an advanced 40nm CMOS low-power fabrication process, the CYW20721 employs high level of integration to reduce external components, thereby minimizing application footprint and costs.



#### CYW920721B2EVK-02 Evaluation Kit

The Evaluation Kit enables you to evaluate and develop single-chip Bluetooth® applications using the CYW20721, an ultra-low-power dual-mode Bluetooth® 5.0 wireless MCU device for Audio.

##### Kit features

- > CYW20721 dual mode (BLE/BR/EDR) Bluetooth® 5.0-compliant wireless MCU for Audio packaged into a SiP module with external Low noise amplifier and Power amplifier
- > Audio Arduino shield with on-board microphones, audio codec chip, headphone and speaker output
- > On-board sensors: 9-axis motion sensor (3D digital linear acceleration sensor, 3D digital angular rate sensor, and 3D digital magnetic sensor) and a thermistor
- > User switches and LEDs
- > USB connector for power, programming and USB-UART bridge

# Highlight products for MCU and Sensor hub

## Use cases



## MCU and sensor hub

### PSoC™ 6 Microcontrollers: 32-bit Arm® Cortex®-M4/M0+

The **PSoC™ 6** family is built on an ultra-low-power architecture, and the MCUs feature low-power design techniques to extend battery life up to a full week for battery powered applications. The dual-core Arm® Cortex®-M4 and Cortex-M0+ architecture lets designers optimize for power and performance simultaneously. Using its dual cores combined with configurable memory and peripheral protection units, the PSoC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm. Designers can use the MCU's rich analog and digital peripherals to create custom analog front-ends (AFEs) or digital interfaces for innovative system components such as MEMS sensors, electronic-ink displays. The PSoC™ 6 MCU features the latest generation of industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable. PSoC™ 6 MCU, paired with Infineon's AIROC™ Wi-Fi, AIROC™ Bluetooth®, or AIROC™ combos radio modules, is the perfect solution for secure, low-power, feature-rich IoT products.



Programmable Analog



Security



Low-Power 1.7-V to 3.6-V Operation



Wi-Fi MCU



CAPSENSE™



Bluetooth® Low Energy (Bluetooth® Smart)

## Product portfolio

Value line	Programmable line	Performance line	Connectivity line	Security line
PSoc™ 60	PSoc™ 61	PSoc™ 62	PSoc™ 63	PSoc™ 64
Arm Cortex-M4 (50 MHz)	Arm Cortex-M4 (150 MHz)	Arm Cortex-M4 (150 MHz) & Cortex-M0+ (100 MHz)	Arm Cortex-M4 (150 MHz) and Cortex-M0+ (100 MHz)	Arm Cortex-M4 (150 MHz) & Cortex-M0+ (100 MHz)
Up to 2 MB Flash / 1 MB SRAM	Up to 2 MB Flash / 1 MB SRAM	Up to 2 MB Flash / 1 MB SRAM	Up to 1 MB Flash / 288 kB SRAM	Up to 2 MB Flash / 1 MB SRAM
				Rich Execution Environment Secure Execution Environment Hardware-based Root-of-Trust and Trusted Services
			BLE	
		ULP/LP		
	CAPSENSE™, UDBs, Opamps, Crypto, PDM-PCM			
SCBs, TCPWMs, QSPI, I²S, USB, DMA, SAR ADC, DAC, LCD, LP COMP, RTC, Efuse, PLLs, OSCs, GPIOs, SmartIO				





For further information on our  
components for wearables visit:

[www.infineon.com/wearables](http://www.infineon.com/wearables)



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- › India ..... 000 800 4402 951 (English)
- › USA ..... 1-866 951 9519 (English/German)
- › Other countries ..... 00\* 800 951 951 951 (English/German)
- › Direct access ..... +49 89 234-0 (interconnection fee, German/English)

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