



Machine Learning with Infineon's AI/ML Ecosystem



Ready Models: our fastest Machine Learning solution

With **DEEPCRAFT™ Ready Models**, companies can utilize the benefits of Edge AI in their products without the resources needed to develop custom machine learning models

- Complete, fully-tested, robust, production ready models
- Enable AI-based features with little to no AI know-how
- Integrate and deploy quickly onto consumer products for fast time to market
- Designed for the edge - low memory footprint and inference time
- For updates: Use OTA Software within ModusToolbox™



Choose your Ready Model: production quality, ready to deploy AI models for different customer verticals



	Smart homes	Wearables	Automotive	Industrial	
 Acoustic	Cough Detection	Cough Detection	Siren Detection	Factory Alarm Detection	Available now
	Snoring Detection	Snoring Detection	Direction of Arrival		In development
	Baby Cry Detection	Siren Detection			
	Direction of Arrival				
 Radar	Gesture Detection	Gesture Detection			
	Surface Detection				
 Accelerometer	Fall Detection	Fall Detection			

Enhance your product with our end-to-end Edge AI solutions

Build, optimize, and deploy robust Edge AI models with DEEPCRAFT™ Studio and ModusToolbox™. Leveraging these software solutions and MCUs like PSOC™ Edge and PSOC™ 6, Infineon customers can create optimal power-efficient intelligent devices. This enables consumers to enjoy smarter, more efficient products. Developers can implement advanced features using XENSIV™ sensors, such as audio detection and gesture detection Ready Models, to create innovative products that detect and respond to various inputs. And the portable PSOC™ 6 AI Evaluation Kit makes steps like data collection and field testing easier than ever.

System approach

- Integrated software for seamless AI model development & deployment
- Extensive code examples
- AI models optimized for Infineon MCUs, like PSOC™ Edge, PSOC™ 6 AI Kit, AURIX™, TRAVEO™ & XMC™

Highlight products

- DEEPCRAFT™ Studio & Ready Models
- ModusToolbox™ Software
- PSOC™ Edge with XENSIV™ MEMS mics: IM69D130 and IM73A135
- PSOC™ 6 AI Kit XENSIV™ sensors: BGT60TR13C radar, DPS368 pressure & IM72D128V mic

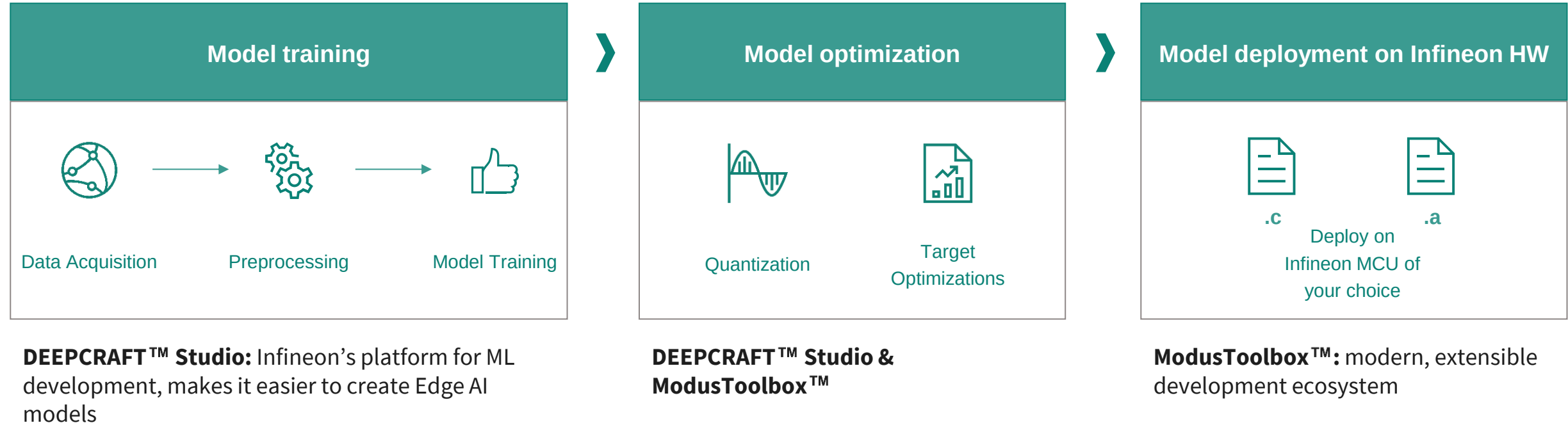
Customer benefits

- Graph UX interface lets you stream sensor data into DEEPCRAFT™ Studio with ease
- ML made easy with DEEPCRAFT™ Studio
- PSOC™ Edge: ML-enhanced sensing, low power, secured, advanced HMI
- PSOC™ 6 AI Kit: prototype & collect real-life data to build ML products fast

Customized Machine Learning with PSOC™ 6 AI Evaluation Kit, PSOC™ Edge, DEEPCRAFT™ Studio and ModusToolbox™



With the seamless integration of **DEEPCRAFT™ Studio** and **ModusToolbox™** companies can build and deploy robust Machine Learning (ML) models. When paired with **PSOC™ Edge**, companies can optimize power consumption and improve efficiency while adding intelligence to products. And the **PSOC™ 6 AI Evaluation Kit** makes data collection and field testing simple.



More information about the products you see

Imagimob family of products

- [DEEPCRAFT™ Studio](#) is Infineon's end-to-end Edge AI development platform that simplifies ML
- [DEEPCRAFT™ Ready Models](#) are production-ready AI/ML models that make it easy to add AI features to any edge device

ModusToolbox™

- ModusToolbox™ is a modern, extensible development ecosystem supporting a wide range of Infineon MCUs

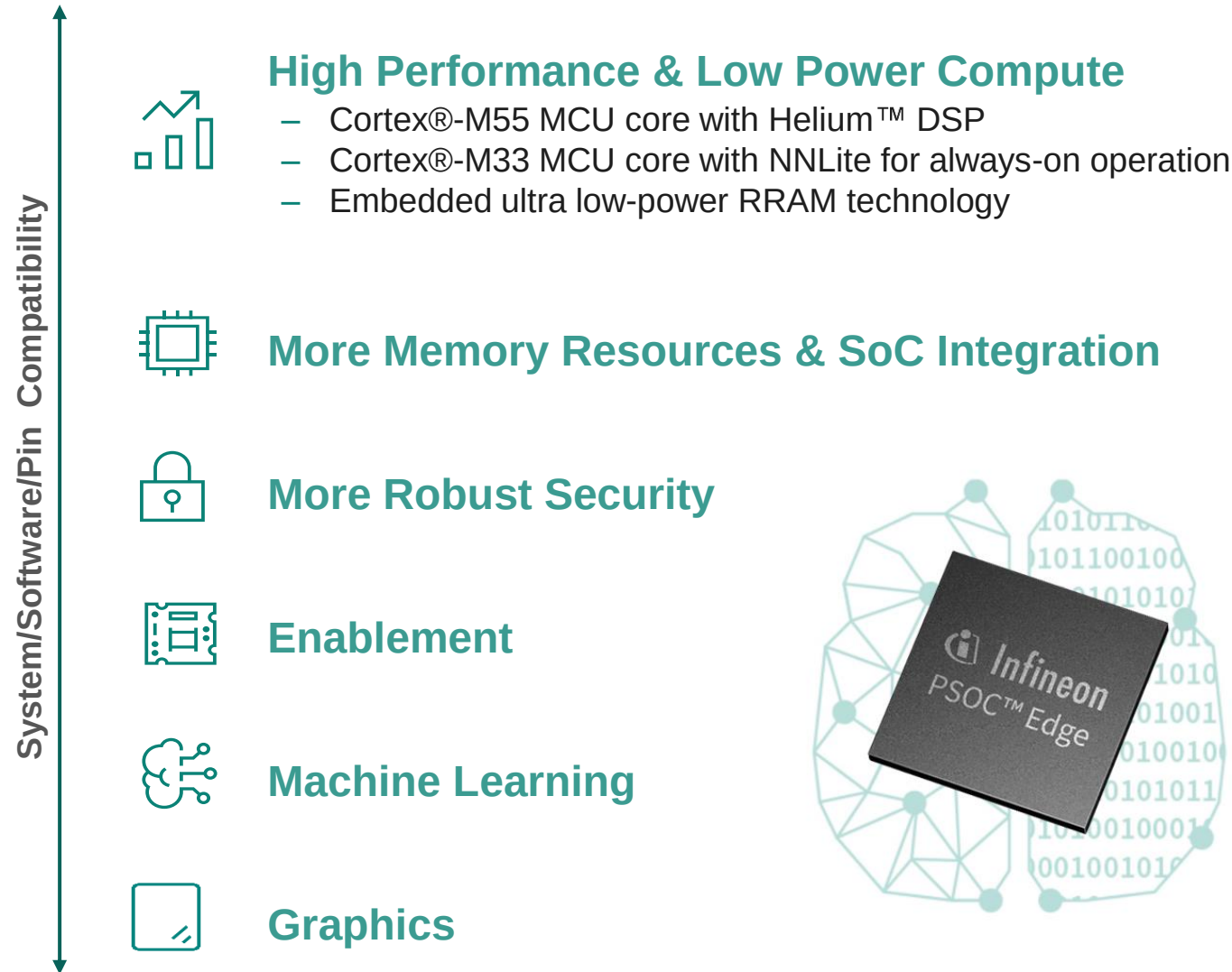
PSoC™ family of products

- [PSOC™ 6 AI Evaluation Kit](#) is perfect for prototyping and collecting real-life data to build ML products fast
 - Includes the following sensors:
 - [XENSIV™ BGT60TR13C](#) - 60GHz FMCW radar with integrated antennas for advanced sensing
 - [XENSIV™ DPS368](#) - small waterproof pressure sensor, environmentally protected against water (IPx8), dust & humidity
 - [XENSIV™ IM72D128V](#) – Ultra-low power, dust and water resistant (IP57) microphone
- [PSOC™ Edge](#) is the next generation ML-enhanced sensing, low power, secured, and advanced HMI high-performance microcontroller family
 - Includes the following sensors:
 - [XENSIV™ IM69D130](#) MEMS microphone with 105dB dynamic range and high output linearity up to 130dBSPL
 - [XENSIV™ IM73A135](#) high performance MEMS microphone with ultra high dynamic range

The following slides provide more detail on the hardware products shown in this demo

PSOC™ Edge –

Next Gen MCU based Edge Device Platform



Product Highlights

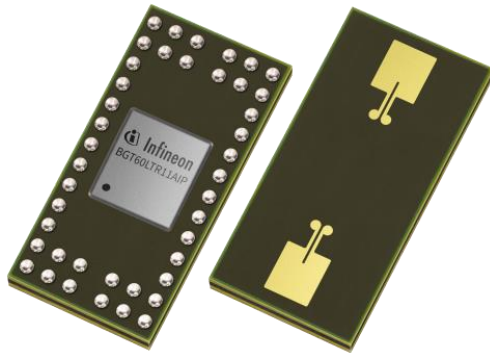
- **High performance, real-time compute domain:**
 - **Up to 5 MB System SRAM**, 256 KB I&D TCMs
 - Low power, real-time compute domain
 - 512 KB RRAM, 1 MB SRAM
- **HMI:**
 - Traditional MCU HMI
 - Local voice, cloud voice
 - Vision for friction free interface & safety
 - **Low power Graphics, up to 1024x768, MIPI-DSI/DBI**
- **ML:**
 - NNLite, Advanced ML leveraging U55 and NNLite
- **Peripherals & IO:**
 - USB, 10/100 Ethernet, CAN, SPI, UART, I2C, I3C, I2S
 - Ultra-low-power always-on analog
- **Security:**
 - Infineon Edge Protect Technology (EPC2 or EPC4)
 - Secured Enclave @ 25 JIL pts, fit for ARM PSA L2/L4

BGT60LTR11AIP Radar

XENSIV™ 60GHz first completely autonomous radar sensor for motion sensing



Low power 60 GHz Doppler radar sensor with antennas in package



Pulsed Doppler mode of operation for low power consumption

Features

- › 1Tx 1Rx Antennas in Package (AIP)
- › 90° Half Power Beam Width (HPBW)
- › Integrated motion and direction detector

Autonomous mode:

- › Up to 7 m detection range for human targets
- › Less than 2 mW power consumption possible

SPI mode:

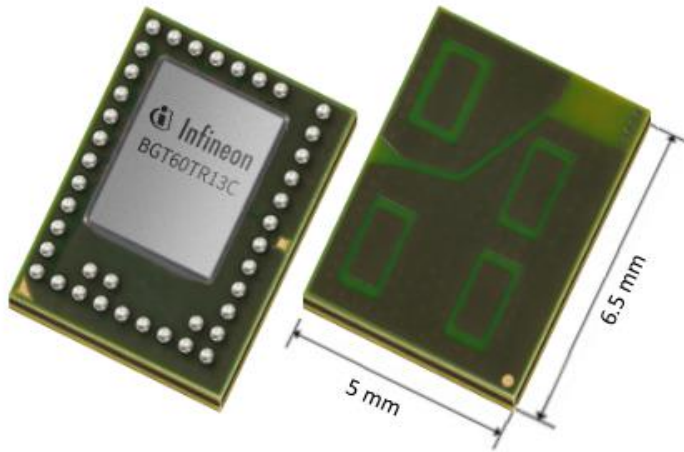
- › Up to 14 m detection range for human targets
- › Advanced functionalities by SPI configuration or further signal processing

BGT60TR13C Radar

XENSIV™ 60GHz radar sensor for advanced sensing



Radar with L-shaped antenna-in-package,
ultra-wide bandwidth FMCW operation and Finite-State Machine



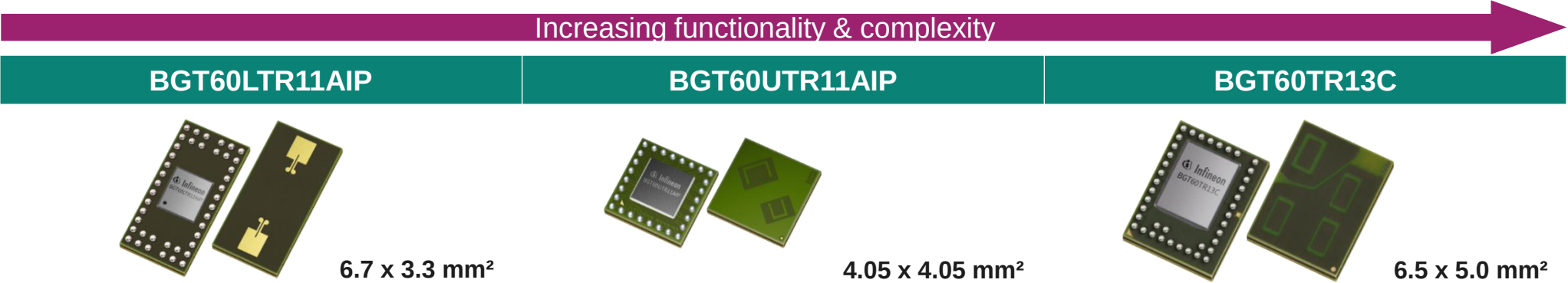
Features

- › 60 GHz radar sensor for FMCW operation
- › 5.5 GHz bandwidth
- › Antenna-in-package (6.5 x 5.0 x 0.9 mm³)
- › Digital interface for chip configuration and radar data acquisition
- › Optimized power modes for low-power operation
- › Integrated state machine for independent operation

Enable **advanced radar sensing** including presence, tracking, vital sensing and gesture control

mmW Radar

for NEW and ADVANCED users



XENSIV™ Sensor Kit	Included in the shield	Includes connector to easily add	
Positioning	Smart & cost-effective PIR replacement	Compact and cost-efficient radar chip for FMCW operations	Enable advanced radar sensing including presence, tracking and gesture control
Operating Mode	Doppler Radar with integrated detectors	FMCW (5.6 GHz BW)	FMCW (5.5 GHz BW)
Motion & Direction	Yes	Yes	Yes
Presence Detection	Only short range (~1m)	Yes	Yes
Range information	No	Yes	Yes
Angular information	No	No	Yes
Main value proposition	Completely autonomous mode: Most convenient way to implement radar in your system	Smallest 60 GHz chip with integrated antennas on the market	Maximum functionality and flexibility: Develop the most demanding radar use cases
Target use cases	Motion detection, (short range)	Presence detection, Gestures, 1D ranging, material classification	Presence detection, gesture control, vital sensing, segmentation, tracking, distance
Target applications	Lighting, monitors, TV, cameras, IoT/smart-home applications, door openers, toilets, ...	Air Conditioners, Smart Home, Smart appliances, health care devices, TVs, laptops, Service robots, ...	Smartphones, laptops, smart home applications, health- & baby care devices, ...

Real CO2 sensor

Based on photoacoustic spectroscopy (PAS) principle

Measure what matters – XENSIV™ PAS CO2



Plug & Play for fast customer design-to-market
Infineon's quality and supply guarantee

Features

- › Small form factor (14 x 13.8 x 7.5 mm³)
- › 5V power supply (IR emitter)
- › SMD package delivered in tape and reel
- › ± 50 ppm $\pm 5\%$ between 400 and 3000 ppm
- › Advanced compensation algorithms
- › Self-calibration algorithms
- › UART, I2 C, PWM interfaces
- › Dust-proof design (ISO 20653:2013-02)

IM72D128 MEMS microphone

Ultra-low power digital XENSIV™ MEMS microphone



Far-field and low volume audio pick-up
Clear audio signals even for highest SPL
High precision audio beams & algorithms



Features

- › Signal-to-noise ratio of 71.5dB(A) SNR
- › Acoustic overload point at 128dBSPL
- › IP57 dust and water resistant
- › Digital PDM interface
- › Flat frequency response: LFRO at 11Hz
- › Narrow sensitivity and phase tolerances
- › Omnidirectional pickup pattern

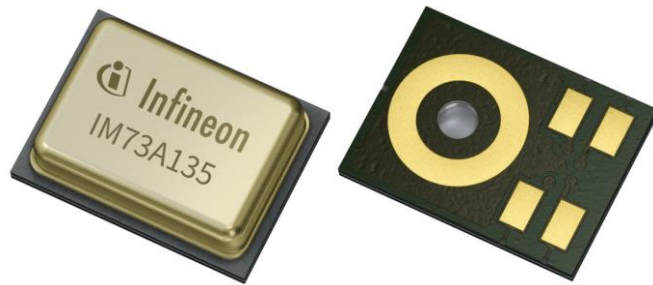
IM73A135 MEMS microphone

High performance XENSIV™ MEMS microphone with ultra high dynamic range



High SNR - Low self-noise
Low distortion - High AOP
Robust IP57

Features



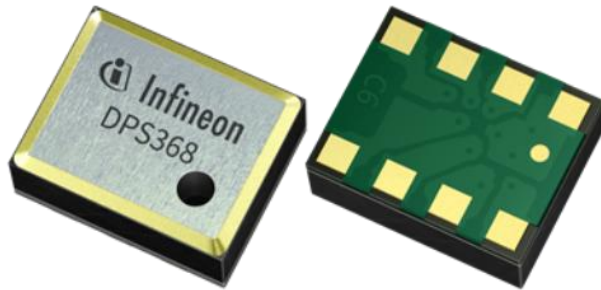
- › Component level IP57 water and dust resistant
- › Signal to noise ratio of 73dB(A) SNR
- › Acoustic overload point at 135dBSPL
- › Flat frequency response with low frequency roll off at 20Hz
- › Power optimized modes determined by VDD level
- › Package dimensions: 4mm x 3mm x 1.2mm
- › Differential output
- › Omnidirectional pickup pattern

DPS368 Digital barometric pressure sensor

Lowest power consumption & highest precision



Fast, ultra-low noise read
Small package
Water, dust & humidity resistant



Features

- › **Small size:** 2.0 x 2.5 x 1.1 mm
- › **Low energy consumption**
Peak current: 345 μ A (pressure measurement)
Standby: 0.5 / 1.0 μ A
- › **Excellent temperature stability**
Pressure temperature sensitivity 0.5 Pa / $^{\circ}$ C
- › **High sensitivity**
Precision: ± 0.002 hPa (2cm)
Rel. accuracy: ± 0.06 hPa
Abs. accuracy: ± 1.0 hPa
- › **Robustness** against water (IPx8)¹, dust & humidity



XENSIV™ Sensor Shield for Arduino

Description

Infineon's XENSIV™ Sensor Shield provides seamless hardware compatibility between sensors, microcontroller and connectivity products. When paired with a MCU / Wi-Fi base board via the Arduino UNO interface, the board enables developers to quickly evaluate and develop with environmental sensors like:

- 60 GHz radars
- PAS CO2 Sensor
- PDM Microphones
- Pressure Sensors
- 6-axis IMU
- 3-axis Magnetometer
- Temperature and Humidity

The shield also features a TFT display (80x160), and OPTIGA™ Trust-M secure element, and a [QWIIC](#) connector for additional peripheral expandability.

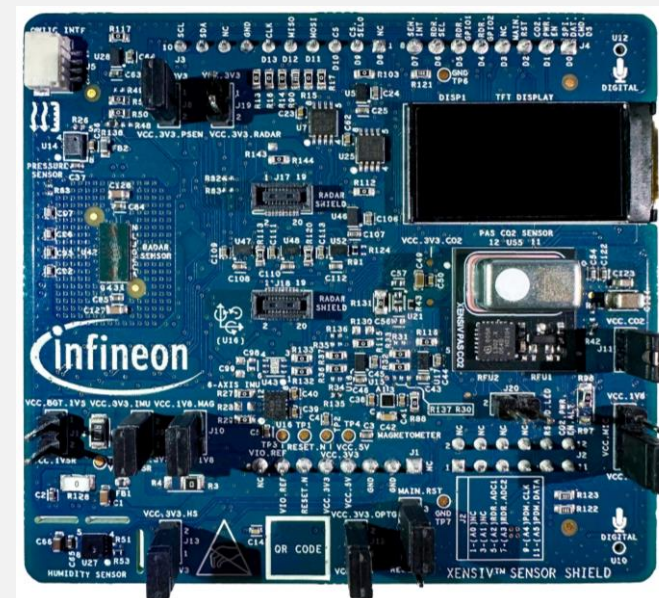
Core Applications

Applications within Smart Buildings/Offices/Homes where there's a desire to capture, display and connect data from any of the included sensors.

Infineon Products

- › Radar: [BGT60LTR11AIP](#)
- › CO2: [PASCO2V15](#)
- › Microphones: [IM72D128V](#)
- › Pressure: [DPS368](#)
- › Security: [SLS32AIA010MKUSON10XTMA2](#)

XENSIV™ Sensor Shield



Related Resources

[ModusToolbox™](#)
[PSoC™ 6](#)
[Wireless Connectivity](#)

NOTE: the kit will initially work with the [CY8CKIT-062S2-43012](#) kit with future planned support of Infineon Bluetooth, XMC™ and Wi-Fi MCU kits

Contacts

Contact: [Leon Farasati](#)

