Infineon's sensor solutions for air conditioners

March 2022
Smartification trends – dominated by Energy domain and Convenience

**Growth** in building market primarily **driven by energy conservation and occupant experience domain**

Source: ABI 2020
Demand based controlled buildings is a strong lever for energy, CO₂ and opex reduction

In EU, buildings are responsible for about 40% of the EU's energy consumption, and 36% of greenhouse gas emissions from energy[2]

Table: Classes of building control from BS EN 15232

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Integrated individual room control, Demand control of heating, cooling and ventilation, Scheduled/preventive maintenance, Energy consumption monitoring</td>
</tr>
<tr>
<td>B</td>
<td>Integrated individual room control with preset or manual intervention, No automatic demand control, Energy monitoring</td>
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<tr>
<td>C</td>
<td>Basic individual room control using thermostat, No demand control, No energy monitoring</td>
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<tr>
<td>D</td>
<td>No automation, No automatic demand control, No energy monitoring</td>
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</tbody>
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For complete definition refer to standard EN 15232

In Germany alone, about 22 million tons of CO₂ saving potential through demand based heating & cooling room control [3]

Sources:
Most cooling, heating and ventilation systems in buildings/houses have manual inputs

Manual control of parameters leads to:

1. Energy wastage
2. Decreased device lifetime
3. User inconvenience
Adaptive and intuitive control can save improve energy efficiency

- True Occupancy
- Localization
- Air quality monitoring

Event input based on external stimuli

Temperature set point

Control Input

Processing Unit

Air conditioner, Heating and Ventilation

Room Temperature

Infineon Proprietary
Infineon sensor solutions enabling energy efficiency, safety and convenience

- MEMS microphones
- CO₂ sensor
- 3D image sensors
- Pressure sensors
- Radar sensors

Infineon consumer sensors

Sensor solutions

Smart Home, Retail and Building

Energy Efficiency and convenience
- Localization: XENSIV™ 60 GHz Radar
- Presence Detection: XENSIV™ 60 GHz Radar
- Air Quality: XENSIV™ PAS CO2

Infineon Proprietary
True occupancy with Infineon presence detection

- Detects presence of static and moving people (sleeping, reading or typing)
- Distance information of the closest person
- Smart power on/off and active stand-by
- Room occupancy for demand based air conditioner systems

BGT60TR13C Radar

AC off when no one is present in the room

AC ON when presence is detected
Localize* the incumbent to create targeted air flow profile

- Range and angle for nearest person
- Presence detection in segments

*BGT60TR13C Radar

*in roadmap
Monitoring the air quality with PAS CO2 in smart homes

- Accurate CO2 measure with no drift
- Small form factor
- Demand based ventilation systems
- Germs and Covid prevention
Flexible to integrated – Sensor solution options from Infineon for improving energy efficiency and convenience in air conditioners

Sensor Evaluation & Use Case Dev on PC/Rpi (RDK)

Porting use case to embedded platform

Use case evaluation on embedded platform

Value added development on MCU (e.g., integration of VUI skills)

Final testing of use case and integration components (sensor + MCU) / module in AC

Radar Demo Board + RDK and PAS CO2 Mini Eval Kit

RDK in Infineon Develope Center with complete kit, documentation

XENSIV™ BGT60TR13C Demo Kit with RDK

XENSIV™ PAS CO2 Mini Eval Board

Connected Sensor Kit

Rapid IoT Connect SoM (PSoC 62 + WIFI/BLE) + XENSIV™ BGT60TR13C Radar + PAS CO2 + DPS368 Pressure Sensor Visualization in sensor cloud

ModusToolbox™ PSoC Software ecosystem

Radar SoM (via partners – Arrow and NISD)

- Presence Detection
- Localization*
- PAS CO2 monitoring

Application example code in ModusToolbox™

- Presence Detection
- Localization*
- FCC certifiable, size and cost optimized

*in roadmap
Radar Development Kit – Get started with Radar Evaluation and Use case development on PC

**Step 1: Sensor Evaluation and Development**

Radar Demo Board for Evaluation and Development

**Step 2: Integration**

Integrate Radar with your choice of MCU/MPU with use case you have developed using Radar Development Kit

BGT60TR13C MMIC
Connected Sensor Kit – From Evaluation to Integration in easy steps

**Step 1: Evaluation**

Power up Connect the Rapid IoT Connect Developer Kit + PAS CO2 wing via USB

**Step 2: Development**

Download ModusToolbox
And get started with value added development on PSoC™ 6 MCU
Connected Sensor Kit – From Evaluation to Integration in easy steps

Step 3: Integration

XENSIV™ PAS CO2

AIROC™ WiFi/BLE Combo

Rapid IoT Connect SoM

PSoC™ 62 MCU

CO₂ ppm reading on smart phone app or triggers automatic window opening
Radar SoM (w/ I/O Board) via partners – Cost and Size optimized module for easy integration with FCC certifiable use case Presence Detection

Step 1: Pre Developed Use Case Evaluation on PSoC™ 6

Radar SoM (BGT60TR13C Radar + PSoC 62 (MCU) + I/O Board)

Step 2: Radar SoM integration

Person comes in the Field of View of Radar and AC turns on automatically
Visit us!

Visit our "Sensor Solutions" webpage!
Part of your life. Part of tomorrow.