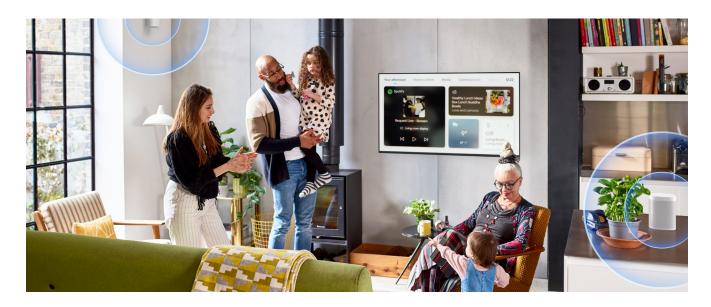# Deliver a New Generation of Sensing and Positioning

Combining secure UWB ranging and short-range radar sensing, this efficient, low-power IC is designed to simplify design-in while enabling new experiences in autonomous homes and the industrial IoT.

Target applications

Autonomous home

- Hands-free home access

- Home entertainment

- Home appliances and automation

Industrial IoT

- Asset tracking

- Access control and visitor management

- Danger zone detection

- HVAC (Heating, Ventilation, and Air Conditioning)/ lighting controls

Ultra-wideband (UWB) technology provides fine ranging and positioning capabilities to a wide range of use cases, including secure access control, indoor positioning, and device-to-device communication for item tracking and tag location. UWB securely determines the relative position of peer devices with a high degree of accuracy and, due to its use of a wideband spectrum, uses little power to send signals and provides stable connectivity with minimal interference. Fine-grained spatial awareness, made possible with UWB ranging, provides location context that is more precise. UWB has a location accuracy of ±5 cm, requires fewer anchors to cover the same area, and can be used either indoors or outdoors to extend navigation capabilities.

As the latest addition to NXP's well-established family of UWB solutions, the Trimension SR250 represents the next leap forward in a world that anticipates and automates. It combines processing, UWB radar and secure UWB ranging on a single IC, for a cost-effective way to provide wide variety of new user experiences based on location, presence, or motion detection across autonomous home and industrial IoT applications.

Key features

- 3D secure ranging
- On-chip radar processing
- Support for 3D and 360-degree AoA, TDOA
- Support for direct battery connection
- Off chip radar processing
- Based on FiRa 3.0 technical specifications

Key benefits

- Enhanced user experience
- Optimized efficiency of appliances through energy savings
- Improved security, safety and privacy
- Reduced BoM

By integrating UWB ranging and on-chip radar processing in one IC, the Trimension SR250 uses sensing to enhance living spaces through presence, location, and motion detection, boosting efficiency and safety. In home entertainment, for example, the added value of UWB radar and ranging can help save energy, by checking for presence of individuals. With audio systems, monitoring and tracking presence can optimize the listening experience. Smart home devices, including household appliances, can use UWB radar and ranging to save energy while increasing comfort.

In industrial IoT environments, the Trimension SR250 can manage access control for employees or locate workers, while UWB radar can increase safety and security while boosting productivity. For instance, a UWB anchor can range an area, authenticate workers, ensure only authorized personnel are present, and detect badge orientation to determine walk direction and prevent access to dangerous areas.

Similarly, a robot equipped with a UWB device can continuously sense for the presence of people or a moving object. When a target is detected an immediate action can be taken, such as stopping the robot, to avoid collisions and other dangerous situations. Geofencing, based on UWB radar and ranging, also helps keep people safe in residential and industrial environments. Combining UWB secure ranging, radar sensing, and 3D AoA into one IC also reduces the overall bill of materials for devices intended for both home and industrial applications.

On-chip radar processing

The Trimension SR250 implements a presence-detection algorithm on-chip . Presence detection is reported to the host processor through a GPIO, can be used as a wake-up signal for the host; or through UWB command interface (UCI) notifications, which can add distance and direction to the detection. Consumer appliances, such as TVs and other entertainment devices, can use the on-chip presence detection to save energy, by entering and exiting sleep mode in response to changes in presence detection. Embedded radar processing can also lower the cost by offloading the host processor, and can save power at the system level because the host can be in sleep mode until a wake-up signal.

Off-chip radar processing

To support more advanced algorithms, such as detecting multiple deterministic targets or monitoring vital signs, the Trimension SR250 can capture CIR data and provide those to the host for processing. A fire alarm equipped with a camera, for example, may be able to identify smoke from a fire, but may struggle to detect the presence of people. UWB radar can be used to augment performance by detecting multiple signs of life that aren't visible to the camera. Alternatively, an air conditioner can automatically adjust its temperature and air flux according to room occupancy, so energy isn't wasted cooling an empty space. Off-chip radar capability, provided by NXP, make it easier to develop use cases that use the host for processing CIRs.

Development support

NXP provides the SDK files for the development of evaluation and development kits that are supplied by NXP's trusted module partners. For more information, visit nxp.com/Trimension page.