ULTRA-WIDEBAND (UWB) POSITIONING AND RANGING OPTIMIZED FOR IoT USE CASES

Designed for fast time-to-market, Trimension™ SR150 and Trimension SR040 ICs are dedicated IoT solutions for highly precise positioning and secure ranging, even in battery-powered tags.

LOW RISK

- Standards-based IC from ultra-high-volume supplier
- Fully interoperable with IEEE® 802.15.4z HRP UWB
- FiRa Certified™

HIGH SECURITY

- Enhanced ultra-wideband ranging technique based on IEEE 802.15.4z
- Integrated hardware crypto accelerators for side-channel resilience
- Trimension SR150: EdgeLock® SE051W eSE pre-integration with applets support, for secure ranging use cases

PRECISE LOCALIZATION

- 6 to 8.5 GHz, 500 MHz bandwidth per channel
- Worldwide coverage using channels 5, 6, 8, and 9
- Integrated time-of-flight (ToF), uplink and downlink time-difference of arrival (TDoA) and angle-of-arrival (AoA) algorithms
- Dual-Rx for AoA functionality (SR150) in 2D and 3D
- Range accuracy (LOS): ±10 cm
- Free RTOS & Linux software support
- Trimension SR040: Optimized for use with CR2032 coin battery

EXCEPTIONAL SIGNAL STRENGTH

- Tx peak power: more than +10.5 dBm
- Receiver noise figure: +4 dB
- High Rx sensitivity: -97 dBm @ 10% PER
- HPRF mode for lower power, higher link budget

Note: Performance and power numbers are indicative.

TARGET APPLICATIONS

- Trackers and TDoA tags (SR040)
- Secure, hands-free physical and logical access control
- Indoor positioning anchors
- Smart home control
- Audio speakers and charging cases
- Ecosystems for secure transactions (payment, transit, etc.)

LOCALIZATION WITH UWB

The fine ranging and positioning capabilities of UWB technology bring precise location and convenience to a variety 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. The use of a wideband spectrum means UWB uses little power to send signals and provides stable connectivity with minimal interference.

ACCURACY

UWB delivers spatial awareness, which is a new dimension of information. Knowing, where a device is, relative to one-self, with extreme level of accuracy provides location-context. Compared to other wireless technologies, including Wi-Fi® and Bluetooth®, which can narrow an item's location to within an area of about 150 cm under ideal conditions, UWB has a location accuracy of 10 cm, and requires fewer anchors to cover the same area.

UWB can be used outdoors to locate objects very precisely, down to the centimeter level, and can be used indoors, where GPS has difficulty operating, to extend navigation capabilities.

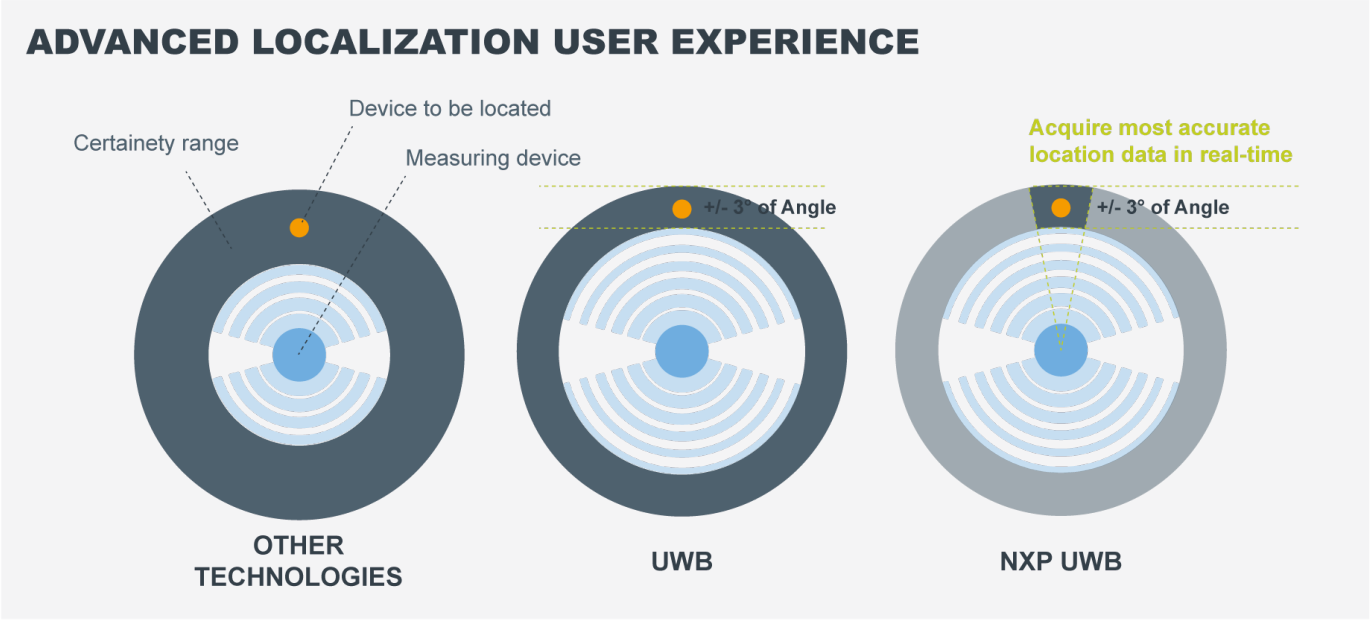
TRIMENSION SR150 FOR IOT DEVICES AND ANCHORS

The Trimension SR150 IC is both forward and backward compatible with IEEE 802.15.4z HRP UWB. The 500-MHz bandwidth, with a pulse rate of 2 ns, supports high-resolution ranging, with LoS accuracy within a range of ±10 cm. The Tx peak power is more than +10 dBm and the receiver noise figure is +4 dB.

Delivered in a WLCSP68 package, the Trimension SR150 has, at its core, an Arm® Cortex®-M33 CPU with TrustZone®. Integrated security hardware accelerators protect overall operation for high-level RF security. A dual-Rx antenna setup enables two channels for AoA functionality, and an onboard CoolFlux® BSP32 DSP is used for ToF, AoA, and radar algorithms.

Building on IEEE 802.15.4z, the Trimension SR150 IC comes with an added level of security, especially when used for access control to protect the privacy that comes with the exchange of access credentials. The added protections make the Trimension SR150 IC more resistant to attempts to trick the system, in what's known as a relay attack, where hackers attempt to intercept and amplify the wireless signal and thereby open a lock, even though the key is not close by.

Several Trimension SR150 IC devices can be placed in a room as UWB anchors to help localize people and objects as they move within the room.



NXP UWB delivers exceptionally precise positioning, with or without LoS

TRIMENSION SR150 + EDGELOCK SE051W FOR SECURE USE CASES

NXP simplifies the development of secure UWB solutions by offering pre-integration with the EdgeLock SE051W eSE. Cryptographic binding of the eSE and the Trimension SR150 takes place in the customer's factory, by setting up a secure channel between the EdgeLock SE051W and the TrustZone of the Trimension SR150's Cortex-M33. This prevents physical unbinding and ensures all communication is protected. Keys to set up the secure channel never leave the eSE or the TrustZone. Key generation for dynamic scrambled time stamp takes place in the eSE, while the dynamic STS generation happens in the Cortex-M33 TrustZone. The EdgeLock SE051W can also be shared with other IoT applications running in the device, such as secure cloud onboarding, device-to-device authentication, device integrity protection, attestation and proof-of-origin.

SR040 FOR BATTERY OPERATION

The Trimension SR040 is a specialized IC for battery-operated IoT devices, including UWB trackers and tags and works with with small batteries such as a CR2032 coin cell.

COMPREHENSIVE SOFTWARE SUPPORT

NXP supplies all the firmware and middleware needed to develop an application that can run UWB autonomously. That includes a complete PHY and MAC implementation (not just the UWB modem). All the complexity of PHY/MAC operation is handled within the UWB IC, so there is no need for real-time interaction from the host processor or microcontroller. Communications between the host and the UWB IC are governed by a FiRa-standard UWB command interface (UCI) running over SPI.

UWB MODULES

Trimension SR150 and Trimension SR040 ICs are available in easy-to-integrate modules supplied by NXP partners. The various Trimension SR150 modules address specific use cases and, as a result, will either include a standalone Trimension SR150 IC or an Trimension SR150 IC with Bluetooth Low Energy and eSE integration, along with extensive software, documentation, and support packages. Module development kits simplify the process of evaluating UWB technology in key use cases, and make it easy to leverage the proven hardware design and flexibility of custom antenna configurations. Also, our Trimension SR150 and SR040 UWB chips have been MFi certified to be interoperable with the Apple U1 chip in Apple devices.

FIRA CERTIFIED

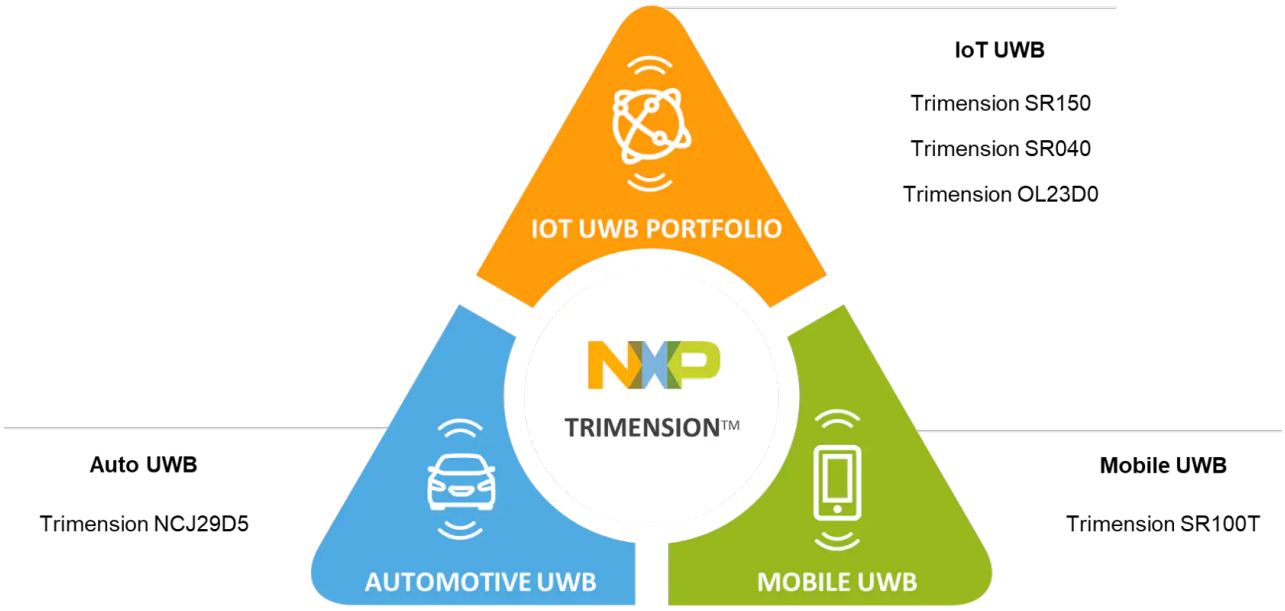
NXP is a founding member of the FiRa Consortium, a collaboration designed to grow the ecosystem for UWB technology so new use cases for fine-ranging capabilities can thrive. Our deep involvement with the FiRa Consortium not only gives us a leading role in FiRa activities—such as the development of interoperability standards, expansion of the UWB ecosystem, and the pursuit of new use cases—it also ensures that our UWB solutions are both interoperable and state-of-the-art.

fira | The Power to Be Precise

TRIMENSION SR150 VERSUS TRIMENSION SR040

Part No.	Target Use Case	Product Highlights
Trimension SR150	IoT Devices	• Dual-RX for AoA functionality • 3D AoA possible with software support for 3 antennas • Direction connection to secure element for protection of secure ranging keys • Full FiRa MAC, multicast, multisession, multi-use-case scheduler support
Trimension SR040	IoT Tags	• Specialized part for battery-operated use cases • Direct V_{BAT} connection from battery • On-Chip embedded Firmware with upgrade capability • Optimized low-power modes • Integrated Tx/Rx switch • HVQFN package for low-cost PCB

NXP offers one of the broadest UWB portfolios available with tailored sensing solutions for vehicles, smartphones and IoT devices.



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