

ULTRA-WIDEBAND TECHNOLOGY



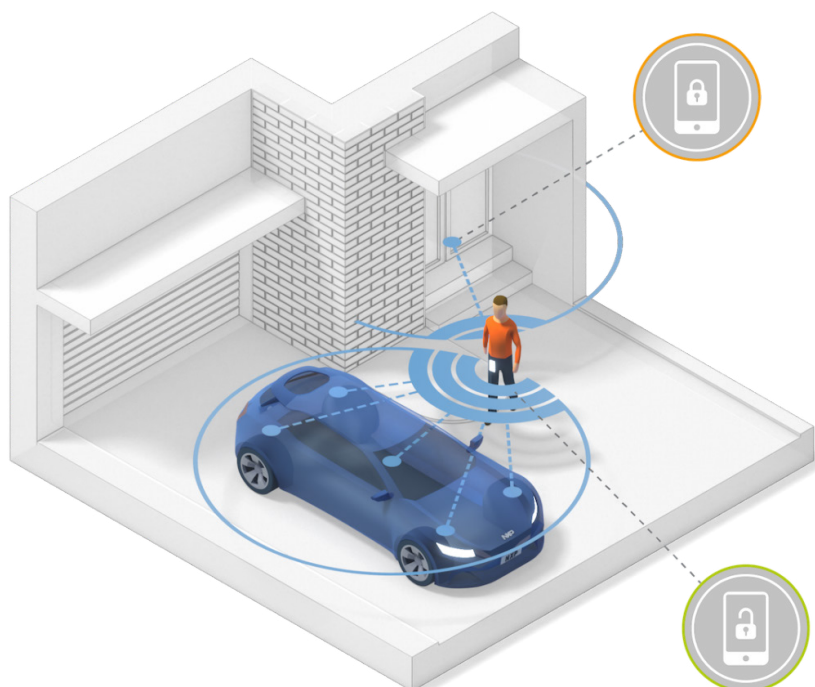
What is Ultra-Wideband (UWB) Technology?

Ultra-wideband (UWB) is a short-range, wireless technology that makes use of wideband radio waves. Compared to other technologies, UWB operates in higher frequency bands (low gigahertz range) and with wider bandwidths (500 megahertz or more), which makes it particularly suitable for accurately measuring distance and determining the precise position of objects and people in cars. UWB does not require the same amount of power or battery consumption as other communications technologies.

What Automotive Innovations Can UWB Support?

Within a vehicle, there are typically several UWB devices that communicate with key fobs or mobile phones. There are a variety of ranging and sensing use cases for UWB technology in vehicles. This includes:

- **Key Fobs** – Automotive companies have historically used radio frequency identification (RFID) or near field communication (NFC) for key fobs. To help protect vehicles from relay attacks (a form of vehicle theft where the signal from a key fob is captured, amplified, and transmitted to another device and then used to open and operate a vehicle), companies are increasingly turning to UWB technology (in combination with other technologies) – which is less susceptible to relay attacks – to support key fobs.
- **Digital Keys** – UWB-enabled mobile phones can remotely lock/unlock or start a vehicle.
- **Remote Park Assistant (RPA)** – UWB technology can help ensure users can park a vehicle automatically while standing outside of it as long as the key fob or mobile key remains in the vehicle's vicinity.
- **Anti-Theft Capabilities** – UWB technology can provide alerts or warnings to vehicle owners when an unauthorized person has entered the vehicle's cabin.



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- **Occupant Detection and Status** – UWB technology can support occupant detection and status features, which may be able to detect if a driver is having a medical emergency or if a child is inadvertently left in the backseat of a parked vehicle.
- **Ground Condition and Mapping** – UWB technology can help assess road surface conditions (an icy or wet road) or determine if a vehicle has left the roadway.
- **Road User Detection** – UWB technology can help determine the proximity of one vehicle to another vehicle or to a vulnerable road user that is obscured.
- **Hands-Free Trunk Release** – UWB technology can enable an authorized user to open the trunk of a vehicle without having to push a button.
- **Parking Access and Payment** – UWB technology can help drivers gain automatic access to a parking garage/lot and pay for parking without tickets or waiting in line.
- **Smart Parking** – UWB technology can quickly guide drivers to available parking spots within a parking garage/lot. This UWB-enabled capability can also be used to support automated or driverless parking.
- **EV Wireless Charging** – UWB technology can help ensure an electric vehicle is properly positioned over a wireless charging pad.

How are Automotive Companies Using UWB Technology?

A survey conducted by the Alliance for Automotive Innovation in 2024, found automotive companies are already using UWB technology for key fobs and planning to significantly increase the use of UWB technology in coming years for key fobs and other features. Specifically:

- Approximately 20 percent of new vehicles are currently using UWB technology for key fobs. Nearly half of automotive companies plan to increase utilization of UWB technology for key fobs over the next 5 years. By the end of the decade, for some automotive companies, UWB technology will support key fobs in nearly 2/3 of new vehicles for some companies.

Within the next 5 years, the majority of automotive companies plan to use UWB technology in their new vehicles for a host of other features. These features include: digital keys, hands-free trunk release, remote parking, rear seat occupant detection, and EV wireless charging.