Welcome!
Texas Instruments New Product Update

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- **Phone lines will be muted**
- **Please post questions in the chat or contact your sales person or field applications engineer**

TI Antenna-on-Package mmWave Radar Sensors

For Automotive Applications

Presented by Neel Patel

Texas Instruments

mmWave Radar Sensors – Technology Overview

What is mmWave Radar Technology?

- mmWave radar sensors measure with high accuracy **range**, **velocity** and **angle** of objects
- mmWave radar technology **works in challenging environmental conditions** such as darkness, extreme bright light, dust, rain, snow and extreme temperatures

Texas Instruments' mmWave Radar Advantages

- **Antenna on Package** – Optimized solution simplifies design & manufacturing challenges
- **Single-chip, Low-power** – Achieved through RFCMOS technology
- **Integrated processing** – Removes the need for an external processor in the system
- **Scalable Portfolio** – SW re-use across Automotive & Industrial platforms, regardless of band
- **Imaging Radar –** Lidar-like performance at the right price point

mmWave Radar Applications

Automotive

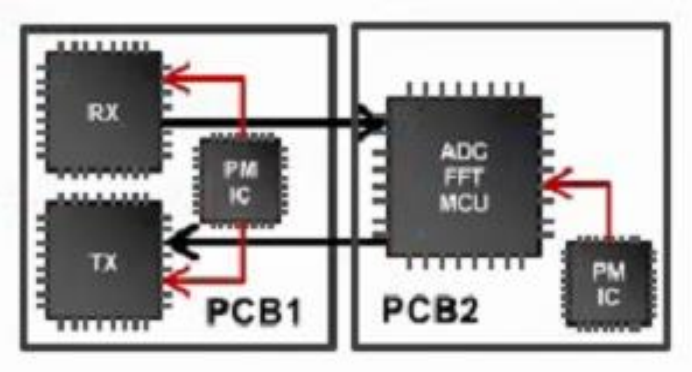


Industrial



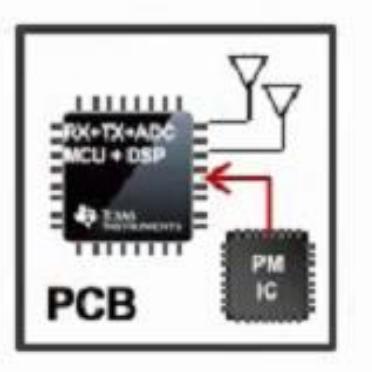
TI Innovation – RFCMOS Evolution

Discrete – RF Front-End Only



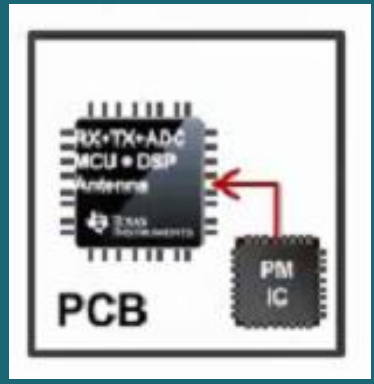
- Multi-Chip
- Larger size
- Complex signal routing
- Noise prone
- Crude safety

Single Chip – Integrated DSP



- Single Chip
- Smaller size
- Simpler design
- High resolution and accuracy
- Low Power
- Built in monitoring (ASIL)
- Programmable core with differentiated SDK

New Antenna-on-Package

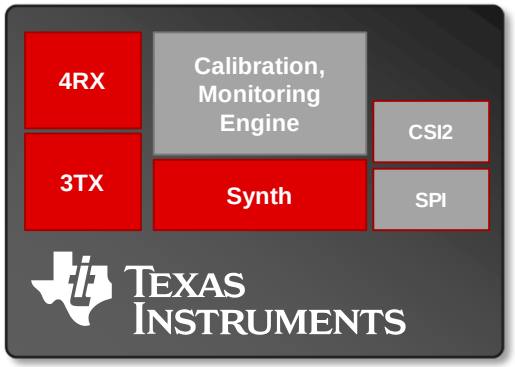


- Single Chip
- **Smallest** size
- **Simplest** design
- High resolution and accuracy
- Low Power
- Built in monitoring (ASIL)
- Programmable core with differentiated SDK

76 – 81 GHz mmWave Sensors

Integrated RF Front-End

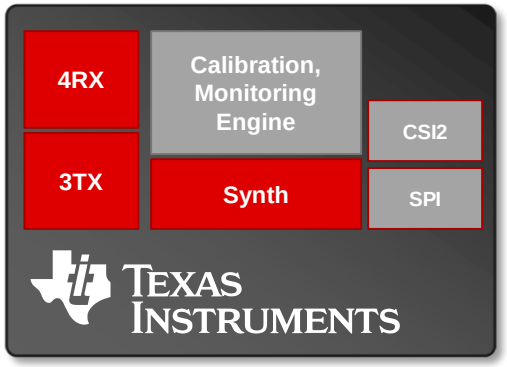
AWR1243



Radar Front-End

- **Use Cases**
  - MRR and LRR
- **ASIL-B capable**
- **In Production**

AWR2243

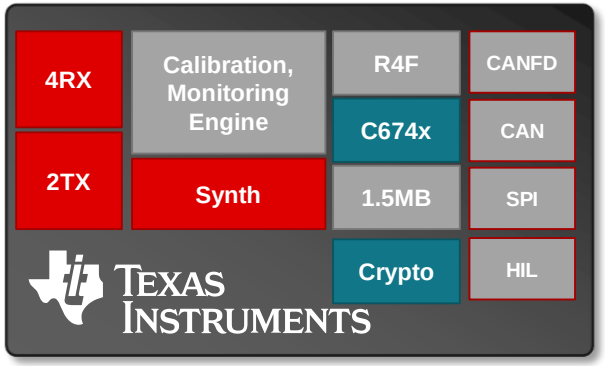


2nd Gen Radar Front-End

- **50% more RF Performance**
- **Use Cases**
  - Imaging Radar Sensor
    - 2x or 4x AWR2243 + External DSP
  - MRR and LRR
- **ASIL-B capable**
- **In Production**

Single-Chip with integrated MCU and DSP

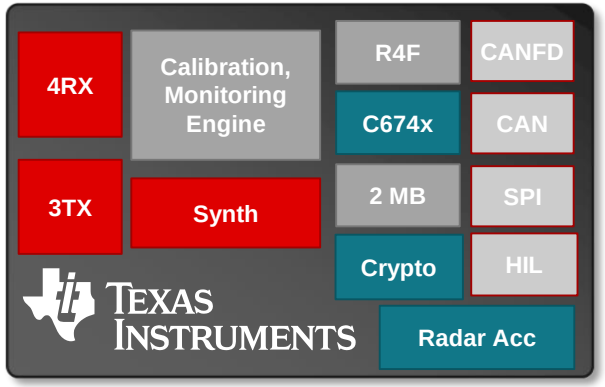
AWR1642



Single Chip Radar

- **Use Cases**
  - SRR Single chip Radar
    - 120m Cross traffic Alert
  - Occupant detection
  - Driver monitoring
- **ASIL-B capable**
- **In Production**

AWR1843(AOP)

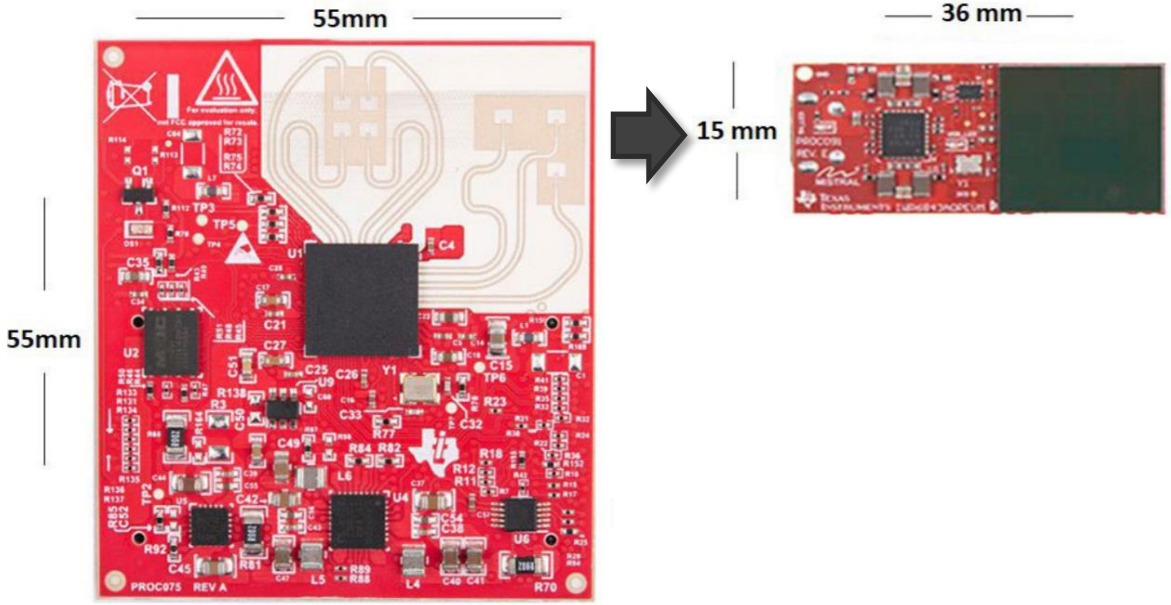


Single Chip Radar

- **Use Cases**
  - Parking w/ height measurement
  - MRR single chip radar
- **Antenna-on-Package variant available**
- **ASIL-B capable**
- **In Production**

Antenna-on-Package (AOP) Design

External Antenna **New AOP**



Samples available **now!**

- **Smallest Form Factor:** enables sensing applications with small space constraint requirements
- **Faster time to market**: with no need for antenna design
- **Manufacturing simplicity:** Enablement to use cheaper PCB materials (like FR4) without any negative impact on the RF parameters

In-Cabin

Child Presence Detection
Child in rear facing child seat

Vital Signs Monitoring
Detect fatigue, sleepy state

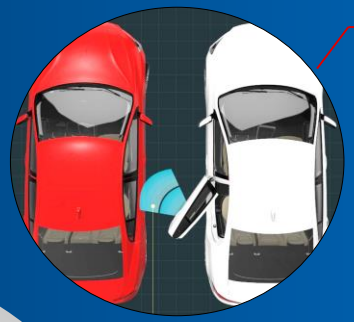
Occupant Monitoring
Airbag deployment control
Comfort control

Gestures Detection
HMI screen control, navigation, volume control

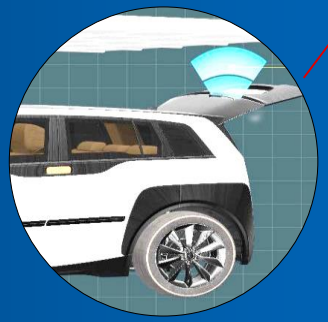
AOP for AUTOMOTIVE

Near Field Sensing

Door Obstacle Detection



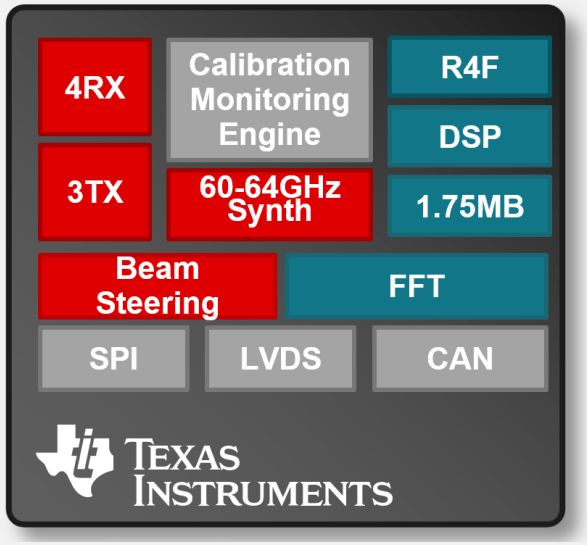
Trunk Obstacle Detection



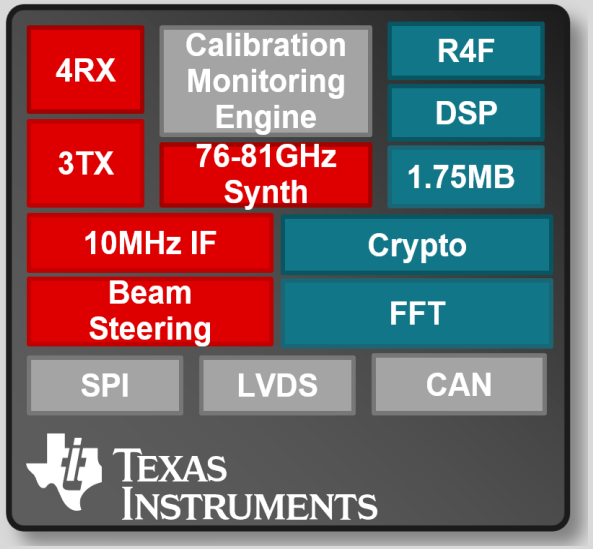
Ultra Short Range Radar
Parking & Low End BSD

60/77GHz Radar – AOP Portfolio Overview

60GHz
In-Cabin



77GHz
Near Field



Common Component / Reusable Software (SDK)

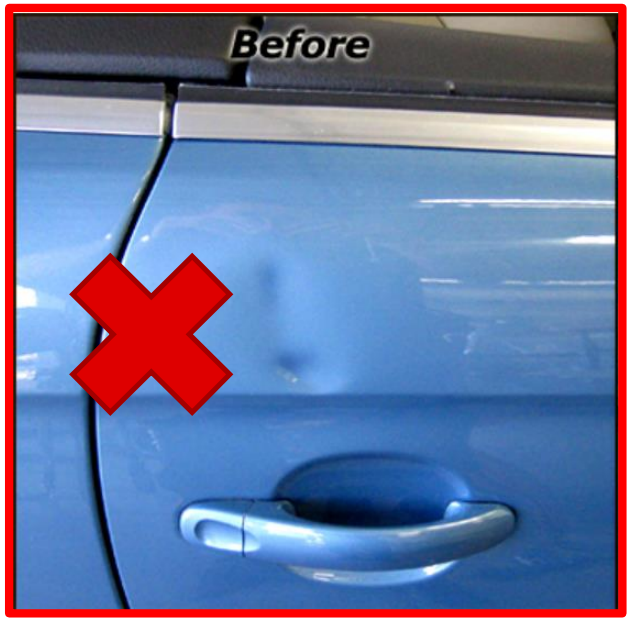
- **Frequency regulation platform-agnostic design:** Pin to Pin compatibility with 60GHz and 77GHz sensors
- **One software investment:** Software re-usable and portable across 60GHz and 77GHz devices
- **Safety story:** ASIL B safety level for automotive

AOP for Near Field Sensing

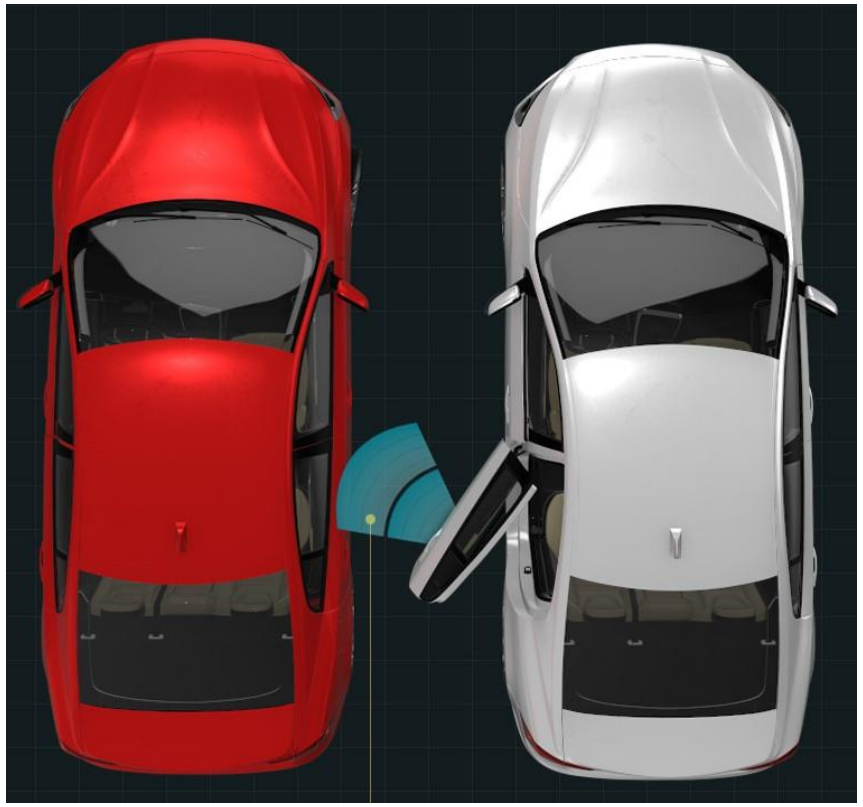
- **Door & Trunk Obstacle Detection**
- **Parking & Basic BSD**

Door and Trunk Obstacle Detection using TI mmWave Radar

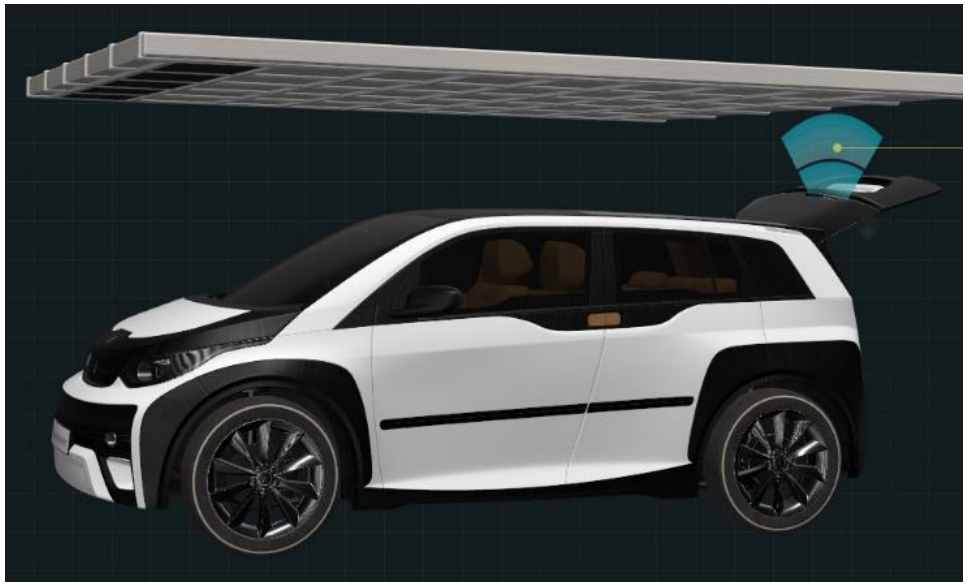
✗ Before Damage ✗



✓ Safe Door Opening



✓ Safe Trunk Opening



TI mmWave Radar Advantage

Ultrasonic

Less accurate than radar with limited range

Not functional when covered with mud, snow

Lacking 360º coverage

Diminished accuracy with heat or small multiple objects

Requires **unsightly holes** in bumper

TI mmWave AOP Radar

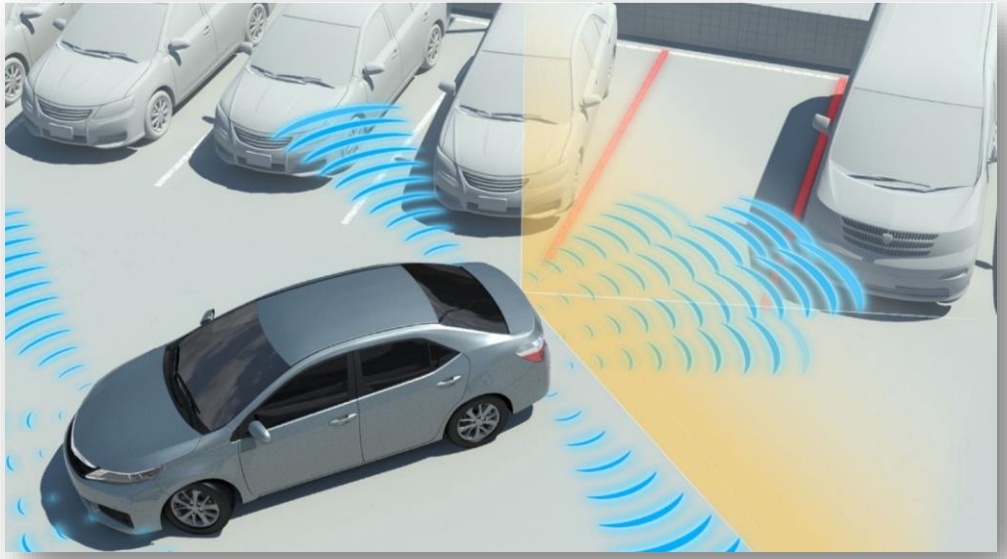
Smallest form factor enables easy vehicle integration in places like door handles

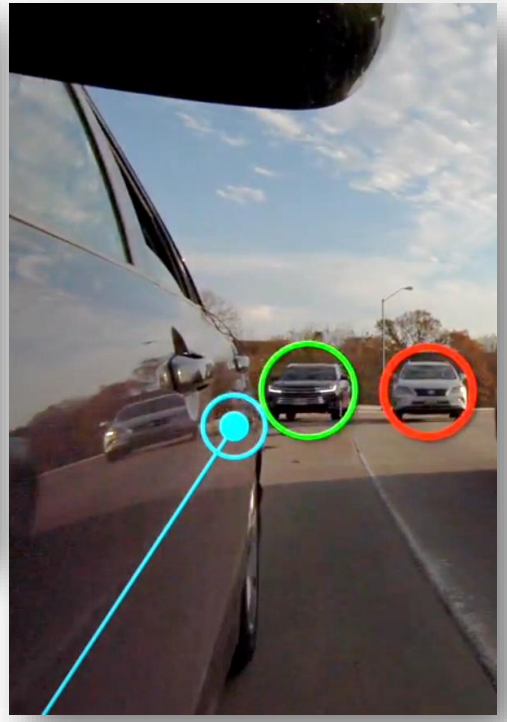
Highly accurate with less than 4cm range resolution

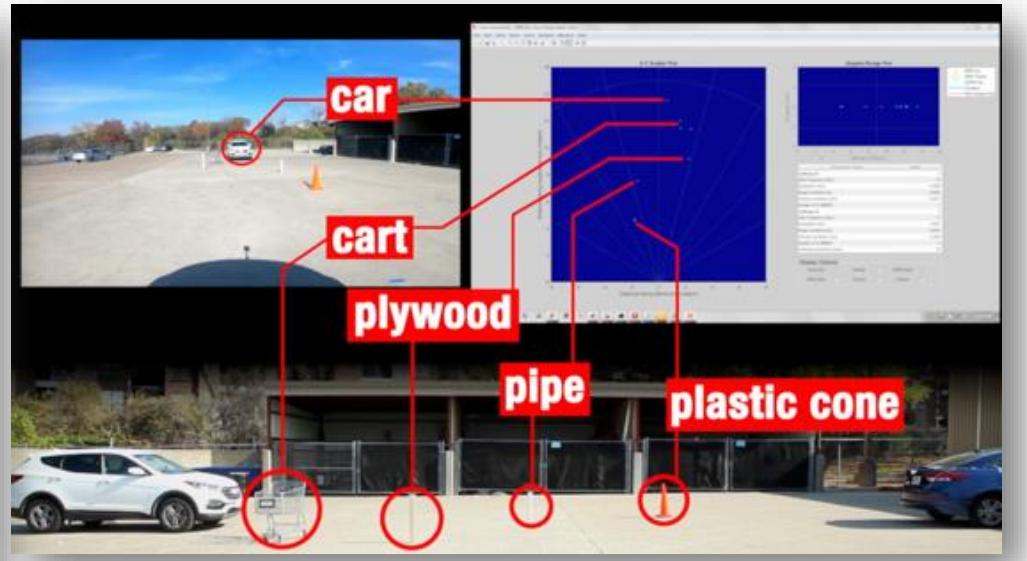
Wider field of view with greater coverage

Robust detection even in challenging weather conditions

Parking and Entry Level BSD using TI mmWave Radar







Robust detection of various object types at different velocities

Wide Field of View in AZ & EL (140°)

Extended Range up to 50+m

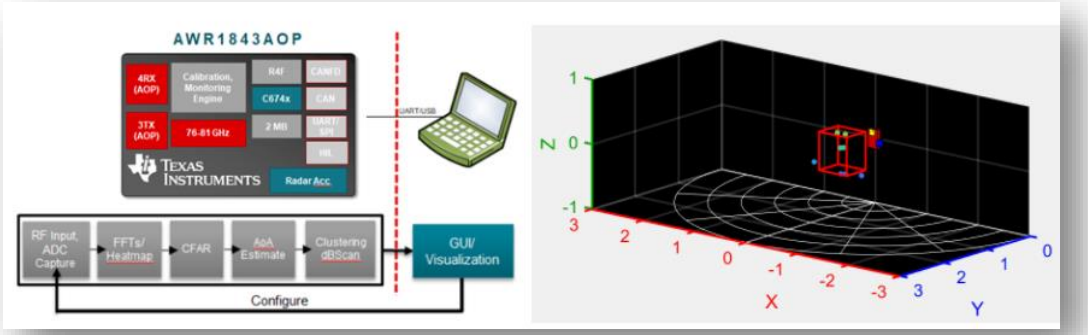
Multi-purpose sensor allows leveraging same sensor for other applications

Evaluation – How to Get Started

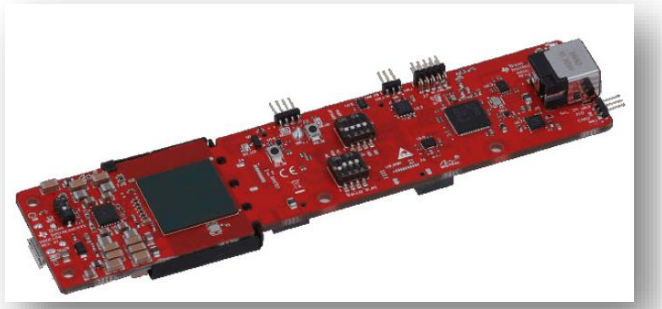
1. **Discover** mmWave radar for Near field Sensing here

2. **Evaluate** the performance
   - AWR1843AOP EVM
   - Reference software on TI Resource Explorer
   - Obstacle Detection & Video
   - Ultra-short Range Radar

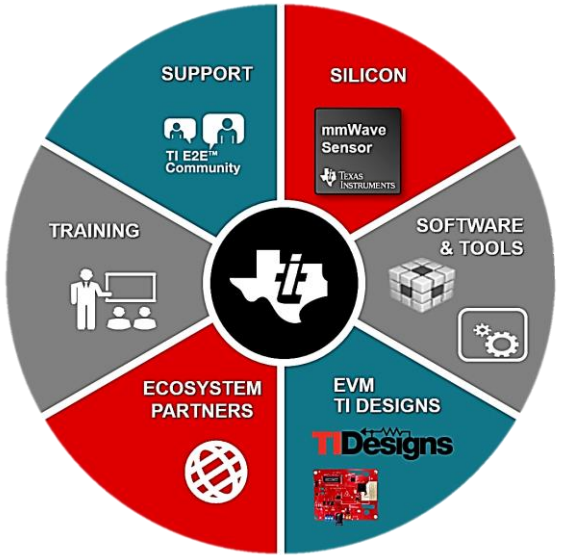
3. **Design** with AWR1843AOP silicon
   - Silicon to design your board with XA1843ARBGALP
   - AWR1843AOP datasheet
   - AWR1843AOP technical documents



Door obstacle detection reference design



AWR1843AOP Evaluation Module



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