New Product Update

Low-power, 77-GHz mmWave radar sensors level up industrial sensing

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Radar Industrial

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What is mmWave radar?

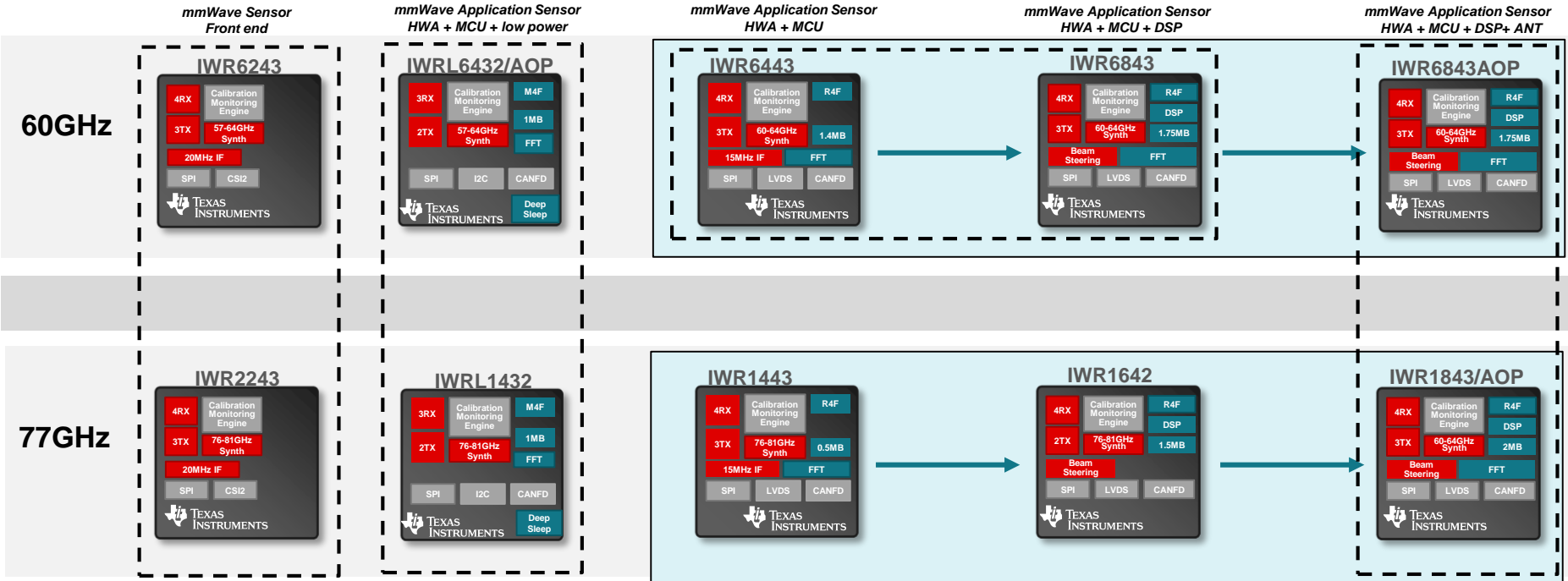**mmWave radar is used to sense people and objects:**

- Range
- Velocity
- Angle

Traditionally, 77-GHz radar has been used in automotive applications but has also been growing for non-automotive applications like:

- Level sensing
- Off-highway vehicles
- Parking barriers
- ebikes and other mobility solutions

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Industrial radar 60GHz/77GHz | portfolio overview

Pin-to-Pin Compatible

mmWave Sensor Front end | **mmWave Application Sensor HWA + MCU + low power** | **mmWave Application Sensor HWA + MCU** | **mmWave Application Sensor HWA + MCU + DSP** | **mmWave Application Sensor HWA + MCU + DSP+ ANT**

60GHz

IWR6243 — 4RX, Calibration Monitoring Engine, 3TX, 57-64GHz Synth, 20MHz IF, SPI, CSI2

IWRL6432/AOP — 3RX, Calibration Monitoring Engine, M4F, 2TX, 57-64GHz Synth, 1MB, FFT, SPI, I2C, CANFD, Deep Sleep

IWR6443 — 4RX, Calibration Monitoring Engine, R4F, 3TX, 60-64GHz Synth, 1.4MB, 15MHz IF, FFT, SPI, LVDS, CANFD

IWR6843 — 4RX, Calibration Monitoring Engine, R4F, DSP, 3TX, 60-64GHz Synth, 1.75MB, Beam Steering, FFT, SPI, LVDS, CANFD

IWR6843AOP — 4RX, Calibration Monitoring Engine, R4F, DSP, 3TX, 60-64GHz Synth, 1.75MB, Beam Steering, FFT, SPI, LVDS, CANFD

77GHz

IWR2243 — 4RX, Calibration Monitoring Engine, 3TX, 76-81GHz Synth, 20MHz IF, SPI, CSI2

IWRL1432 — 3RX, Calibration Monitoring Engine, M4F, 2TX, 76-81GHz Synth, 1MB, FFT, SPI, I2C, CANFD, Deep Sleep

IWR1443 — 4RX, Calibration Monitoring Engine, R4F, 3TX, 76-81GHz Synth, 0.5MB, 15MHz IF, FFT, SPI, LVDS, CANFD

IWR1642 — 4RX, Calibration Monitoring Engine, R4F, DSP, 2TX, 76-81GHz Synth, 1.5MB, Beam Steering, FFT, SPI, LVDS, CANFD

IWR1843/AOP — 4RX, Calibration Monitoring Engine, R4F, DSP, 3TX, 60-64GHz Synth, 2MB, Beam Steering, FFT, SPI, LVDS, CANFD

o **Frequency regulation agnostic design :** Pin-to-pin compatibility with 60GHz and 77GHz sensors.

o **One Software Investment:** Common software API and framework across 60GHz/77GHz devices make software re usable and portable across devices.

o **Safety story:** SIL 2 level for Industrial safety applications

IWRL1432 | product overview

Designed for small form factor, low BOM cost and lower power applications

Integrated transceivers:
- 3 Rx and 2 Tx

Integrated frequency synthesizer:
- 77GHz to 81GHz

Processing:
- Arm® Cortex®-M4F MCU @ 160 MHz
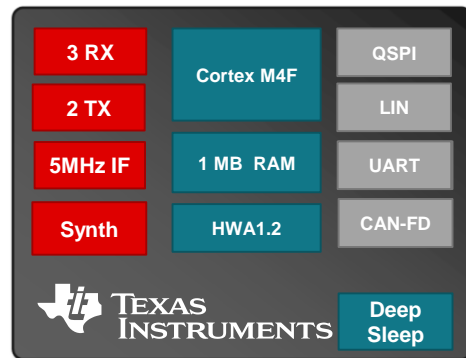- Integrated FFT, CFAR-CA HWAs

Memory:
- 1.0 MB SRAM

Interfaces:
- SPI, UART, I2C, QSPI, GPIOs

System simplification:
- Multiple power modes to enable ultra-low power
- One, two or three power-rail topologies (1.8V, 1.2V, 3.3V)

Package:
- 6.45 x 6.45 mm FCCSP (0.5mm pitch) -- Samples Now

3 RX	Cortex M4F	QSPI
2 TX		LIN
5MHz IF	1 MB RAM	UART
Synth	HWA1.2	CAN-FD
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Sample/EVM: Now

Production: 2024

* Early production options available

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Level sensing

- Contactless measurement of liquids, solids, and powders up to 100m
- Immune to foam, vapor, powder, dust, condensates
- Minimal influence by temperature and pressure

- Targeting 4-20mA loop powered systems
- <4mJ / measurement
- <1mm accuracy
- SIL-2 certified

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Other applications

Off-highway vehicles

- Agriculture
- Construction
- Forklifts
- Etc.

Mobility solution sensors

- ebikes
- Scooters
- Etc.

Parking barrier sensors

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High accuracy low power sensor | lab

Resource Explorer

- Embedded Software
  - Radar Toolbox - 1.20.00.11
    - Front Page
    - Getting Started with xWRL1432
    - Getting Started with xWRL6432
    - Applications
    - Documentation
    - Example Projects
      - Examples Overview
      - ADAS
      - Area Scanner
      - Automated Doors And Gates
      - Automotive Body Sensors
      - CAN SBL
      - Classification
      - Diagnostic Monitor Ref
      - Fundamentals
      - Gesture Recognition
      - InCabin Sensing
      - Interference Mitigation
      - Kick To Open
      - Level Sensing
        - Level Sensing Overview
        - High Accuracy
        - High Accuracy Low Power Sensors
          - High Accuracy Low Power Sensors Release
          - High Accuracy Low Power Sensors Us
          - High Accuracy xWRL14xx AppSS
          - High Accuracy xWRL64xx AppSS

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High Accuracy Low Power Sensors User Guide

Table of Contents

- Overview
- Theory
- Requirements
- Quickstart
- Build the Firmware from Source Code

High accuracy example uses a ZoomFFT

ZoomFFTs use 2 FFTs

- 1 coarse FFT to find a peak (or multiple)
- A zoomed-in FFT, analyzing a portion of the peak at much higher resolution

This is how to achieve accuracy of <1mm

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IWRL1432BOOST | evaluation module

Operates in the 76-81 GHz band

Compatible with

- DCA1000 EVM for raw ADC data capture
- MCU LaunchPad™ development kit ecosystem

Interfaces:

- LIN
- CAN
- UART
- SPI
- LVDS
- DCA1000 data capture interface
- Booster / LaunchPad connector

Angular resolution of 29⁰ in azimuth and 58⁰ in elevation

Rx Antenna array   Tx Antenna array

Level Sensing

Peak No	Distance in meters	Power in dB
1	1.965	57.0
2	2.607	42.2
3	3.417	42.2
Power in mW: 5.8		

Note : Peaks are ordered based on their relative power. Peak with the highest relative power is designated as Peak 1

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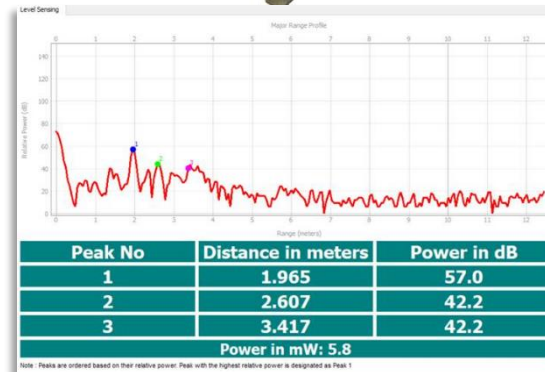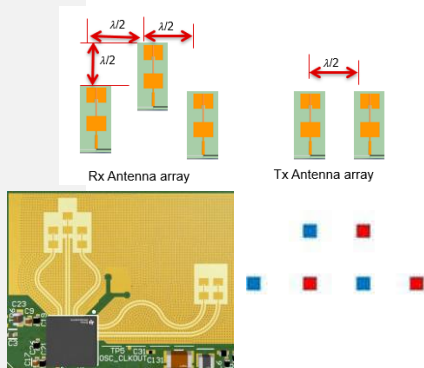
Development resources

Radar Academy
Learn mmWave radar fundamentals
Modules, videos, app notes

Radar Toolbox
Demonstrate and develop radar solutions
Examples, software, labs

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Links to learn more

Content type	Title	Link to content / details
Product page	IWRL1432	Link
Evaluation module	IWRL1432BOOST EVM	Link
Development tools	Radar Toolbox	Link
Radar education modules	Radar Academy	Link

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Visit www.ti.com/npu

For more information on the New Product Update series, calendar and archived recordings

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