High performance 76-81GHz radar for vehicle control and safety applications

D3 Engineering integrates Texas Instruments mmWave radar technology into compact modules ready for integration into vehicle systems. The embedded radar modules facilitate development of applications ranging from blind spot detection and parking assist to cross traffic alert and adaptive cruise control.

76-81GHz Radar-on-a-Chip

These modules integrate a TI AWR1443 radar-on-a-chip RF front end with antennas and a variety of communication and connectivity options. The self-contained FMCW transceiver chip simplifies the implementation of automotive radar sensors in the 76-81GHz band. Texas Instruments' low power 45nm RFCMOS process enables monolithic implementation of a three transmitter / four receiver system with built-in PLL and ADC. With most of the required functions integrated on the monolithic CMOS die, D3 Engineering created a compact radar module incorporating the TI mmWave device, power management, boot PROM ICs, and a PC board antenna. The D3 Radar Module is one third the size and half the weight of state-of-the-art lidar range finders. This allows easy placement of the sensor in plastic enclosures for rugged designs with minimum weight and no need for optics.

The ARM R4F (lock-step) based processor subsystem provides on-chip radio configuration, control, and calibration. Built-in self-test (BIST) provides continuous monitoring and self-calibration of the RF and analog subsystems.

FMCW transceiver
Integrated PLL, transmitter, receiver, baseband, and ADC 76-81GHz coverage with 4GHz available bandwidth

Radio processor for built-in calibration and self-test
ARM Cortex R4F-based radio control system
Built-in firmware (ROM)
Self-calibrating across frequency and temperature

The integrated processor provides measurement output (including object location, speed, and velocity) directly over serial or CAN interface, without the need for external processing of complex radar signals.

The module is controlled via an API interface to the on-chip Cortex-R4F application processor. The user provides power and a serial connection (SPI, CAN) to set up and read data from the module. Some parts (e.g., AWR12xx) offer additional raw data output capabilities via LVDS/CSI ports.

76-81GHz Radar Sensors

Additional modules are in development to offer higher levels of performance and flexibility via a programmable digital signal processor (DSP), addressing standard short-range, mid-range, and long-range automotive radar applications.

OEM/ODM Production Modules and Embedded System Development

D3 Engineering supports OEM/ODM customers with embedded system development and customized production modules for automotive radar applications.

D3 Engineering is a platinum partner in the TI Design Network and a Premier Ecosystem Partner for radar and vision systems development.

Features
Texas Instruments AWR1xxx mmWave all-CMOS Radar Technology
Small Form Factor Module
Low Power, High Performance
Ambient Temp Range –40°C to 85°C
Simple Interface (Serial, Power)
Easy Integration into Embedded Systems
Long-LifeTime Availability and Support
Customization and Integration with DesignCore™ Platforms

ADAS Applications
Adaptive Cruise Control (ACC)
Automatic Emergency Braking
Blind Spot Detection (BSD)
Pedestrian/Bicyclist Detection
Lane Change Assist (LCA)
Rear Collision Avoidance (RCA)
Proximity Warning
Parking Assist
Driver Monitoring
D3 Engineering provides Starter Kits, Reference Designs, custom development services, and production modules for embedded radar systems. Dedicated radar test lab
Extensive experience in >60GHz RF technology
Hardware and antenna design
Software, firmware, and algorithm development
Integration and fusion of other sensor modalities (visible, lidar, IR)
Algorithm optimization
Regulatory and certification
Prototype, pilot, and ODM production

AUTOMOTIVE RADAR MODULES
We provide modules for demonstration and prototype, and transfer the production module designs for automotive applications.

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<tbody>
<tr>
<td>Device</td>
<td>TI AWR1443</td>
<td>TI AWR1642</td>
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<td>4 RX 2 TX 76-81GHz</td>
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<td>High-Gain</td>
<td>Standard</td>
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<td>Features</td>
<td>Complete radar-on-a-chip solution for entry-level radar applications</td>
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<td>Radar Sensor for integration with external DSP</td>
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<td>77GHz radar-on-a-chip solution for entry-level radar applications</td>
<td>Onboard processor with algorithms for Range FFT, Doppler FFT, Angle Estimation, and Object Detection</td>
<td>Additional DSP for algorithms above plus Kalman Filtering, Object Classification, Car Network Communication</td>
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<tr>
<td>Available</td>
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<td>4Q 2017</td>
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*This module is currently available as an unlicensed test module. Contact D3 for availability of CE/FCC certified modules.

ACCELERATE TIME TO MARKET
D3 Engineering provides a Radar Starter Kit for rapid development of your proof-of-concept prototype. We support additional radar system development with our proven DesignCore™ Reference Designs and our full-cycle embedded system design services. Our expertise with radar, image sensors, optics, video analytics, and imaging system design will help you get to market faster, while reducing the risks and costs of new product development.

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