High performance 76-81GHz mmWave sensor for industrial sensing and automation applications

D3 Engineering integrates Texas Instruments mmWave technology into compact modules ready for integration into industrial OEM/ODM products. The embedded modules facilitate development of applications such as autonomous industrial vehicles and robotics, building automation, occupancy sensing, surveillance, drones, medical applications and more.

76-81GHz mmWAVE-ON-A-CHIP

These modules integrate an IWR1443 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 industrial 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 PCB 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 motoring 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.

OEM/ODM PRODUCTION MODULES AND EMBEDDED SYSTEM DEVELOPMENT

D3 Engineering supports OEM/ODM customers with embedded system development and customized production modules for industrial 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 IWR1xxx mmWave Radar-on-a-Chip 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

APPLICATIONS

- Autonomous Industrial Vehicles and Robotics
- Materials Handling
- Factory Automation
- Building Automation
- Drones and Surveillance
- Traffic Monitoring
- Industrial Sensors for Precision Distance, Angle, and Velocity Measurement
- Level Probing and Vibration Monitoring
**D3 ENGINEERING**

**RADAR TEAM EXPERTISE**

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

**INDUSTRIAL RADAR MODULES**

We provide modules for demonstration and prototype, and deliver production modules for OEM/ODM applications.

<table>
<thead>
<tr>
<th>Model</th>
<th>D3RM-I14</th>
<th>D3RM-I16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>TI IWR1443</td>
<td>TI IWR1642</td>
</tr>
<tr>
<td>Radar/RF</td>
<td>4 RX 3 TX</td>
<td>4 RX 2 TX</td>
</tr>
<tr>
<td></td>
<td>76-81GHz</td>
<td>76-81GHz</td>
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<tr>
<td>Interfaces</td>
<td>CAN SPI</td>
<td>CAN SPI</td>
</tr>
<tr>
<td>Starter Kit</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Features</td>
<td>77GHz radar-on-a-chip solution for entry-level radar applications</td>
<td>Complete radar-on-a-chip solution</td>
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<tr>
<td></td>
<td>Onboard processor with algorithms for Range FFT, Doppler FFT, Angle Estimation, and Object Detection</td>
<td>Additional DSP for algorithms (RM-I14) plus Kalman Filtering, Object Classification, Network Communication</td>
</tr>
<tr>
<td>Available</td>
<td>Now*</td>
<td>2017</td>
</tr>
</tbody>
</table>

*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.

**CALL:** 1-585-429-1550  
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**VISIT:** D3Engineering.com/Solutions/Autonomous-Systems/Industrial