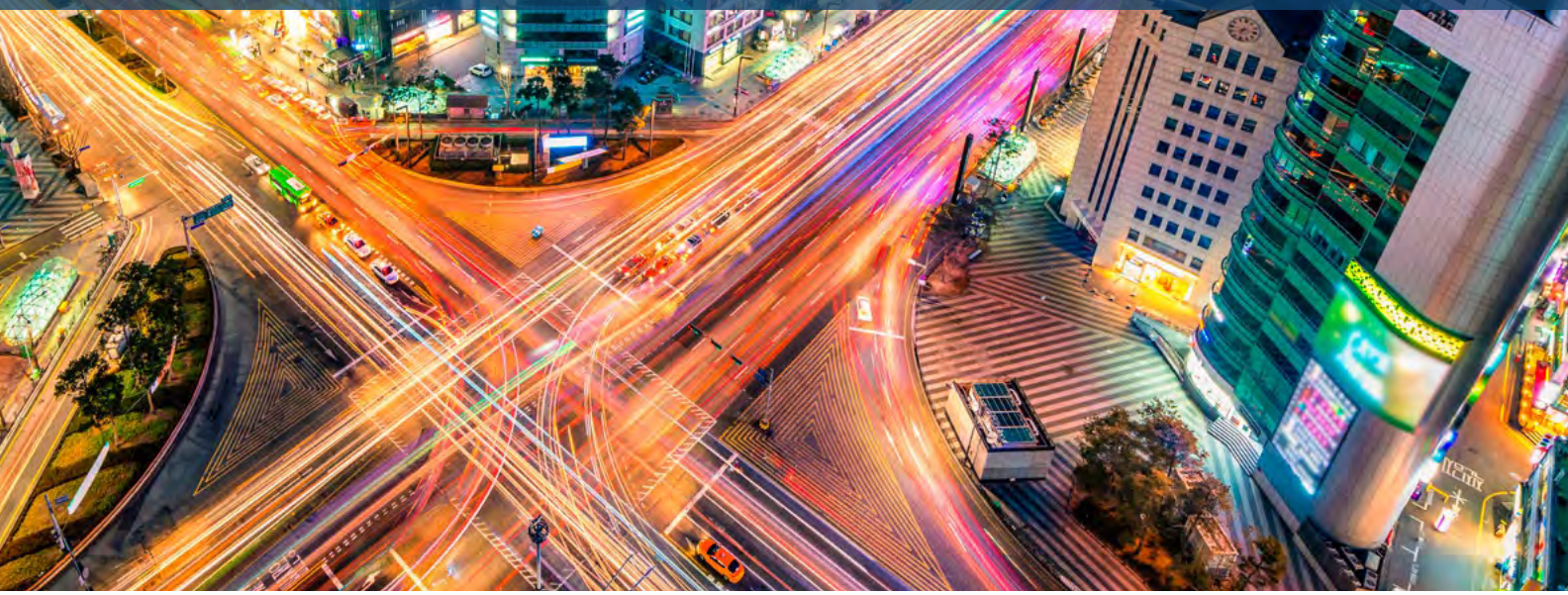
ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™

# ENABLING SMART TRAFFIC WITH ADVANCED TRAFFIC CONTROL SYSTEMS



## What Is an Adaptive Traffic Control System (ATCS)?

An adaptive traffic control system (ATCS) is a self calibrating control solution that automatically adapts the timing of a traffic lights, based on real-time traffic conditions, to optimize the flow of traffic. ATCS offers many benefits and is a key component of the fast growing smart traffic or intelligent traffic systems (ITS) market. The global ITS market is valued at $4B today and expected to grow to $22B by 2022 at 33% CAGR.

As traffic needs grow and smart city initiatives become more popular, ATCS has become an increasingly important area of investment. In the U.S. alone, less than 1% of existing traffic signals utilize ATCS and the National Traffic Signal report card rates the nation's traffic signal management at a mere D+. The value of the lost economic productivity due to time wasted in traffic congestions, wasted fuel, and the effects of pollution is staggering—in the billions of dollars. As a result, the demand for better traffic management solutions is greater than ever before.

ATCS helps solve many traffic congestion problems, regain lost productivity, and prepare the infrastructure to support the economy of the 21st century. Countries, states, and cities across the globe are seriously considering revamping their infrastructure with the next generation of ATCS solutions. This offers a huge growth opportunity for companies developing, deploying, and maintaining ATCS solutions and a chance to build the global infrastructure to meet the needs of tomorrow.

Adaptive traffic control systems are commonly used to optimize the timing of traffic lights based on:

- Traffic queue lengths
- Average speed of traffic
- Arterial travel time/delay
- Number of stops
- Intersection delays
- Unexpected events, such as accidents, construction, or breakdowns
- Pedestrian movement

***Key Benefits of ATCS***

- Improved flow of traffic
  - Up to 50% faster flow of traffic
  - Up to 25% reduction in travel times
- Fewer stops, accidents, and crashes
- Faster responses to unprecedented traffic conditions and fluctuations
- Reduced fuel consumption and pollution
- Improved driver satisfaction due to reduced delays
- Improved economic productivity due to less wasted time in traffic

## Advantages of Multichannel Microwave Radar ATCS

- Cost-effective solution due to simpler installation and minimal maintenance requirements
- Long range of up to 200 m
- Unaffected by light conditions, dust, dirt, or moisture
- Multichannel system can monitor traffic in multiple lanes simultaneously
- Can detect, track, and monitor speed and direction of a moving object
- Can detect objects as small as 70 cm

## Common ATCS Detector Technologies

- Inductive loops
- Video cameras
- Microwave radar
- Aggregated cell phone signals

## Benefits of Analog Devices' 24 GHz Radar-Based ATCS Solution

- Full signal chain solution
  - Complete bits-to-antenna solution from one vendor
- Multichannel system
  - Multiple objection detection and tracking
  - Greater field of view
  - Lower cost compared to using multiple single-channel radar chips
- State-of-the-art performance
  - Best angular resolution
  - 1.5× detection range
  - 2× sensitivity
  - Low power consumption
- Flexibility and scalability
  - Unrestricted design choices, unlike fully integrated single chip radars
  - Easily scalable in multiples of 4 channels

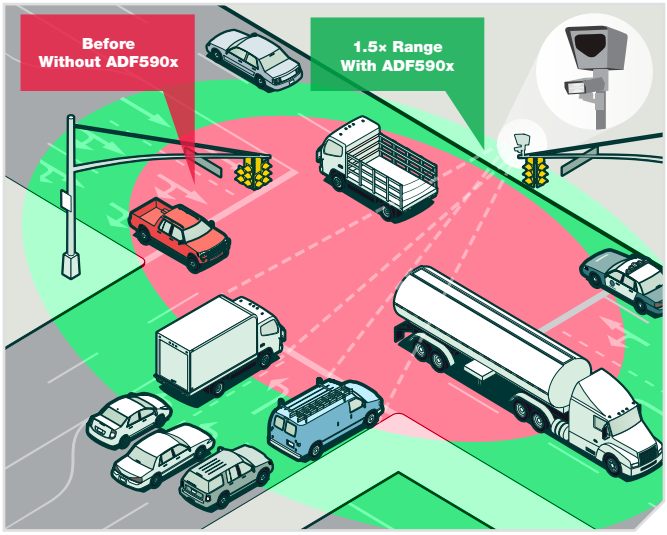



*Figure 1. Busy intersections: more cars detected at a wider range.*

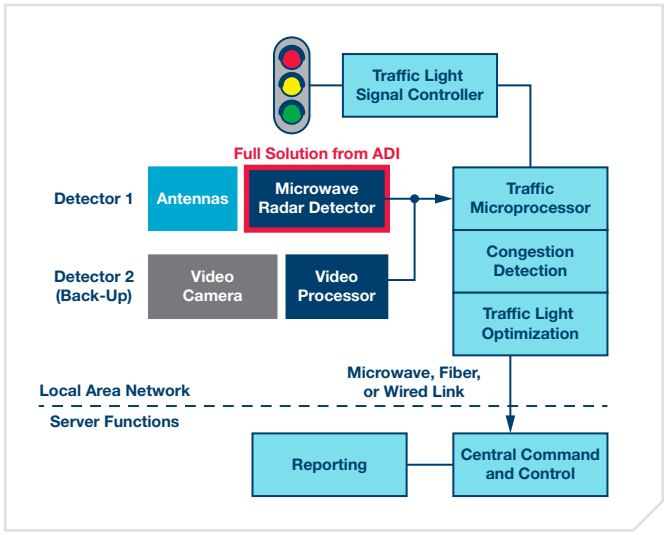



*Figure 2. Typical ATCS system diagram.*

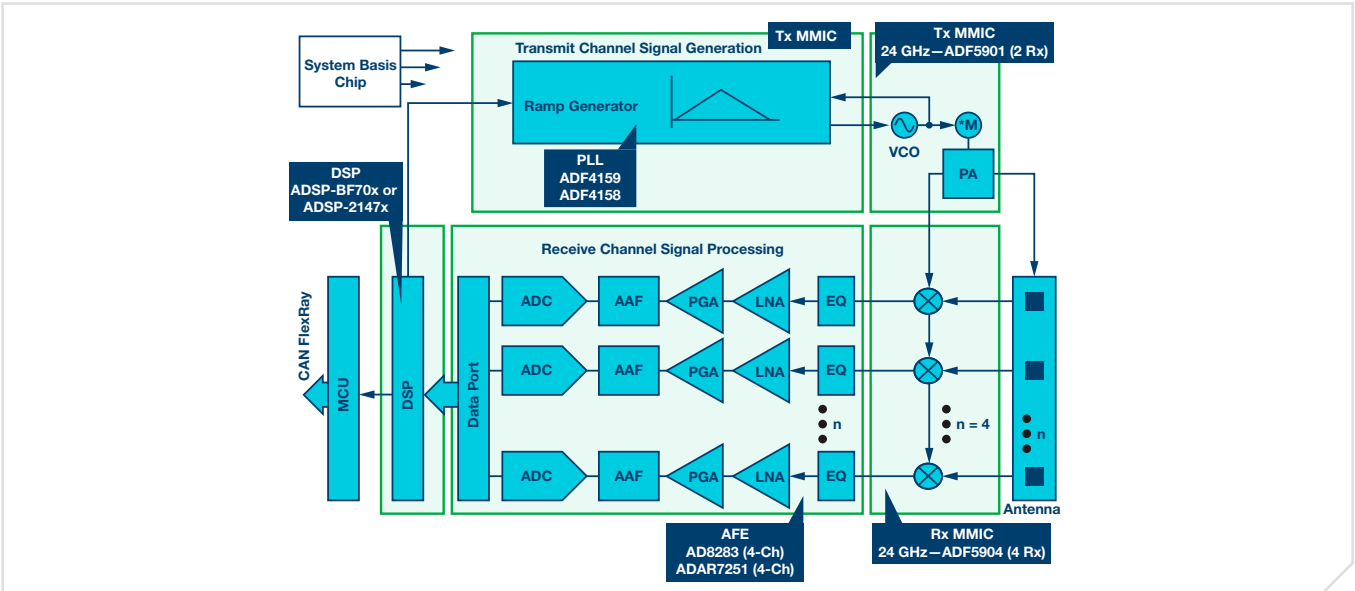



*Figure 3. Complete microwave radar-based ATCS detector solution from ADI.*

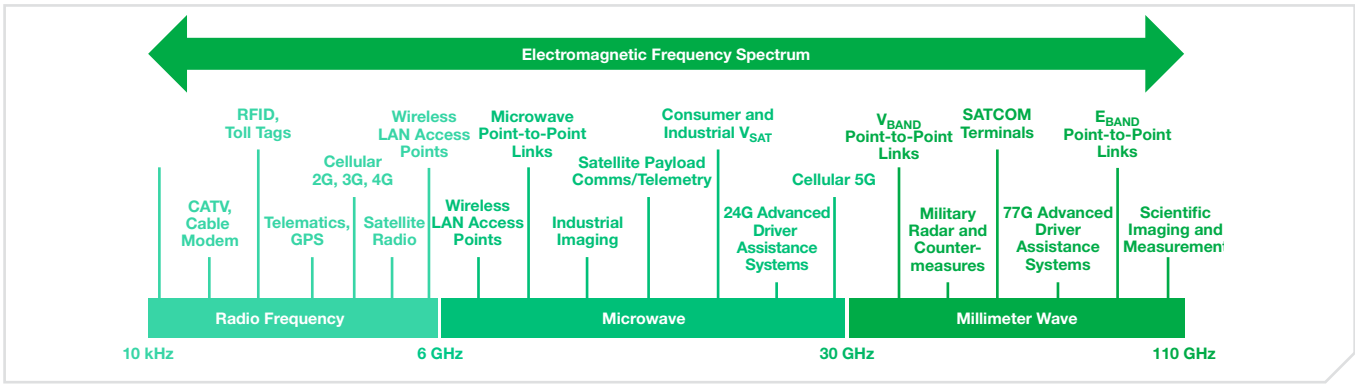
## About Us

Analog Devices (NASDAQ: ADI) is a world leader in the design, manufacture, and marketing of a broad portfolio of high performance analog, mixed-signal, and digital signal processing (DSP) integrated circuits (ICs) used in virtually all types of electronic equipment. Since our inception in 1965, we have focused on solving the engineering challenges associated with signal processing in electronic equipment. Used by over 100,000 customers worldwide, our signal processing products play a fundamental role in converting, conditioning, and processing real-world phenomena such as temperature, pressure, sound, light, speed, and motion into electrical signals to be used in a wide array of electronic devices. We focus on key strategic markets where our signal processing technology is often a critical differentiator in our customers' products—namely the industrial, automotive, communications, and consumer markets.

We currently produce a wide range of innovative products—including data converters, amplifiers and linear products, radio frequency (RF) ICs, power management products, sensors based on microelectromechanical systems (MEMS) technology and other sensors, and processing products, including DSP and other processors—that are designed to meet the needs of our broad base of customers.

## Our RF, Microwave, and Millimeter Wave Capabilities

Analog Devices offers the broadest portfolio of RF ICs, covering the entire RF signal chain from dc to beyond 100 GHz, now available on *analog.com*. With over 1000 high performance RF ICs, ADI offers a wide variety of RF function blocks, as well as highly integrated solutions for the communication, test and measurement instrumentation, and aerospace and defense markets.




## Idea-to-Product Design Support

ADI's RF and microwave products are supported by a full range of design resources to ease the development of RF systems, including free design tools, FMC rapid prototyping platforms, Circuits from the Lab® reference designs, and EngineerZone® technical forums.


Technology and Product Innovation

Design Engineering

System Engineering


Tools, Support, and Reference Designs

Application Engineering

Production, Test, and Assembly

Global Customer Quality Support

Worldwide Sales Contacts

Global Distribution Channel

## Support at Each Step of Design

- Next-generation design guidance
- Troubleshooting
- Global delivery
- Quality and reliability support
- Test and evaluation
- Design
- Part/module selection
- System design
- Design guidance

## Ahead of What's Possible

ADI enables our customers to interpret the world around us by intelligently bridging the physical and digital with unmatched technologies that sense, measure, and connect. We collaborate with our customers to accelerate the pace of innovation and create breakthrough solutions that are ahead of what's possible.

## Why Analog Devices?

- Your long-term technology partner
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- Industry's strongest wideband product portfolio enables versatile and future proof designs
- Proven quality and support of a semiconductor market leader

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## Circuits from the Lab Reference Designs

Circuits from the Lab reference designs are built and tested by ADI engineers with comprehensive documentation and factory-tested evaluation hardware.

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