

The World Leader in High Performance Signal Processing Solutions



Automotive Webinar

October, 2013

Making Tomorrow's Cars Better



Safer

Protect; Prevent; Predict



Greener

Hybrid, electric, and internal combustion engine advancements



Smarter

Information and entertainment converging



Submit Your Questions Online
At Anytime During the Webcast



Mark Gill
VP Automotive

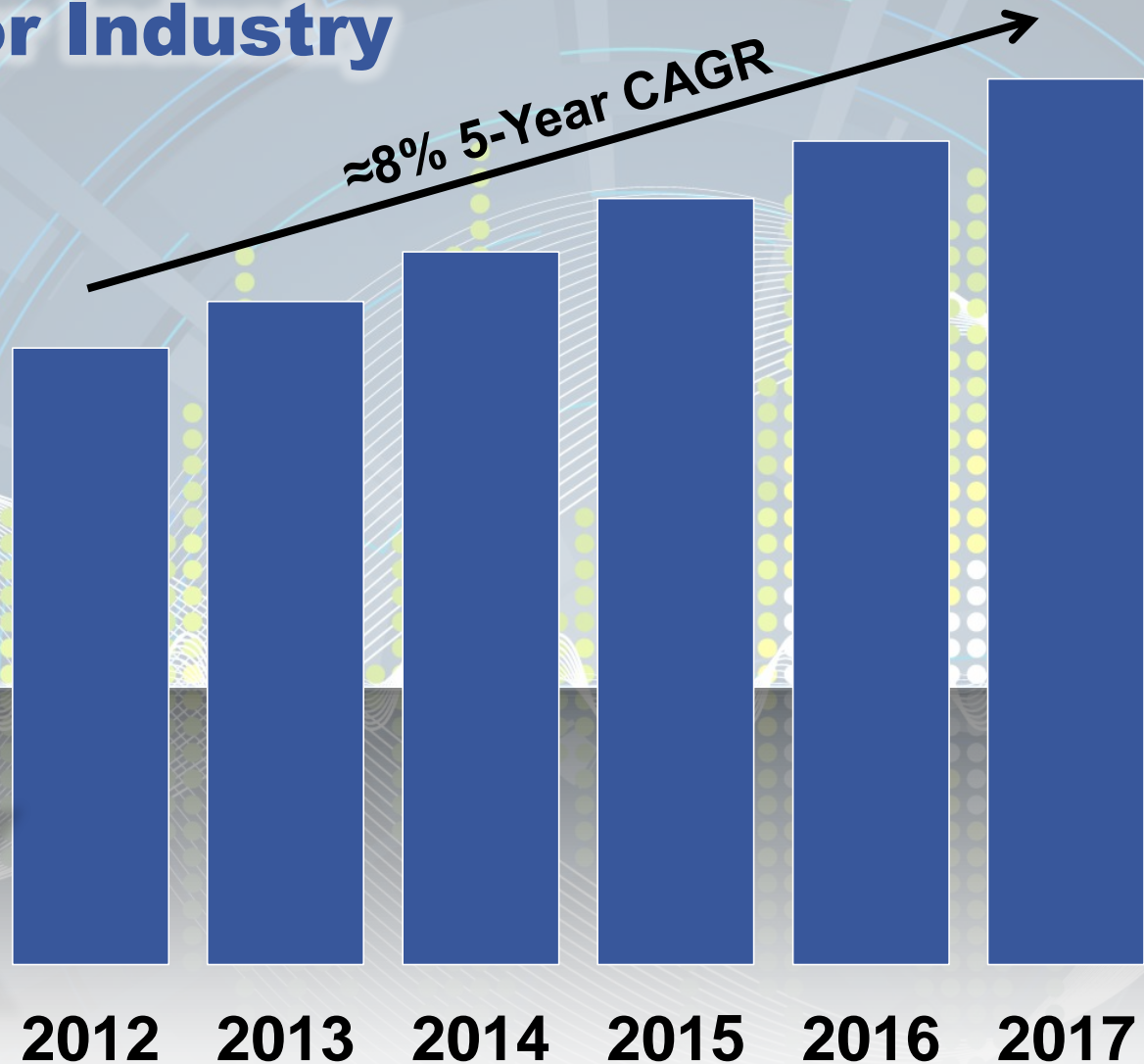
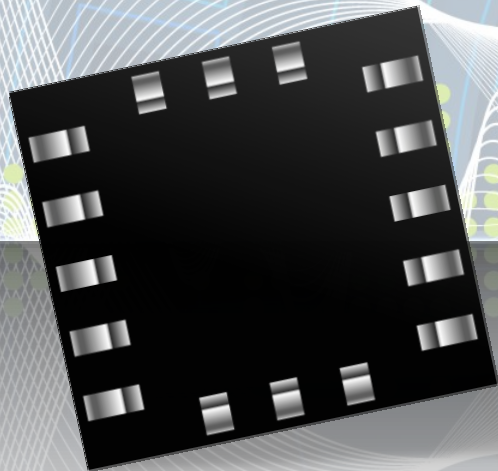


David A. Zinsner
VP Finance & CFO



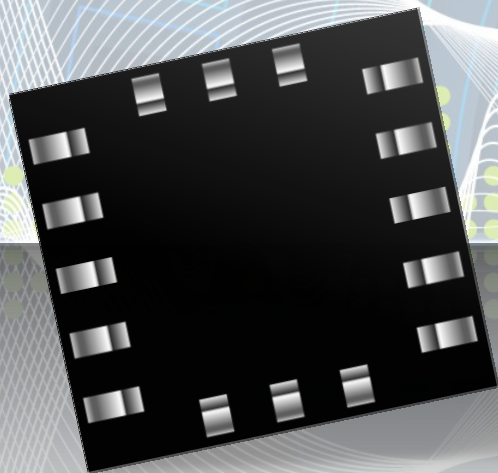
Maria C. Tagliaferro
Director of Corporate
Communications

Worldwide Automotive Semiconductor Industry



2020 →

ADI \$5 Billion Automotive SAM



Greener






Smarter



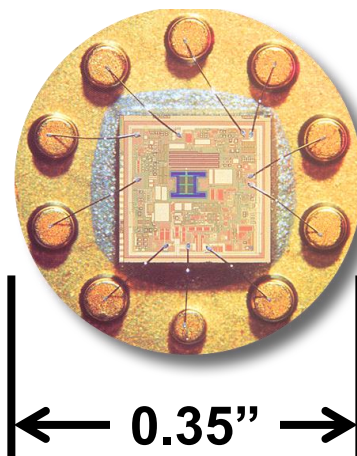
Safer

20+ Years Serving Automotive Safety

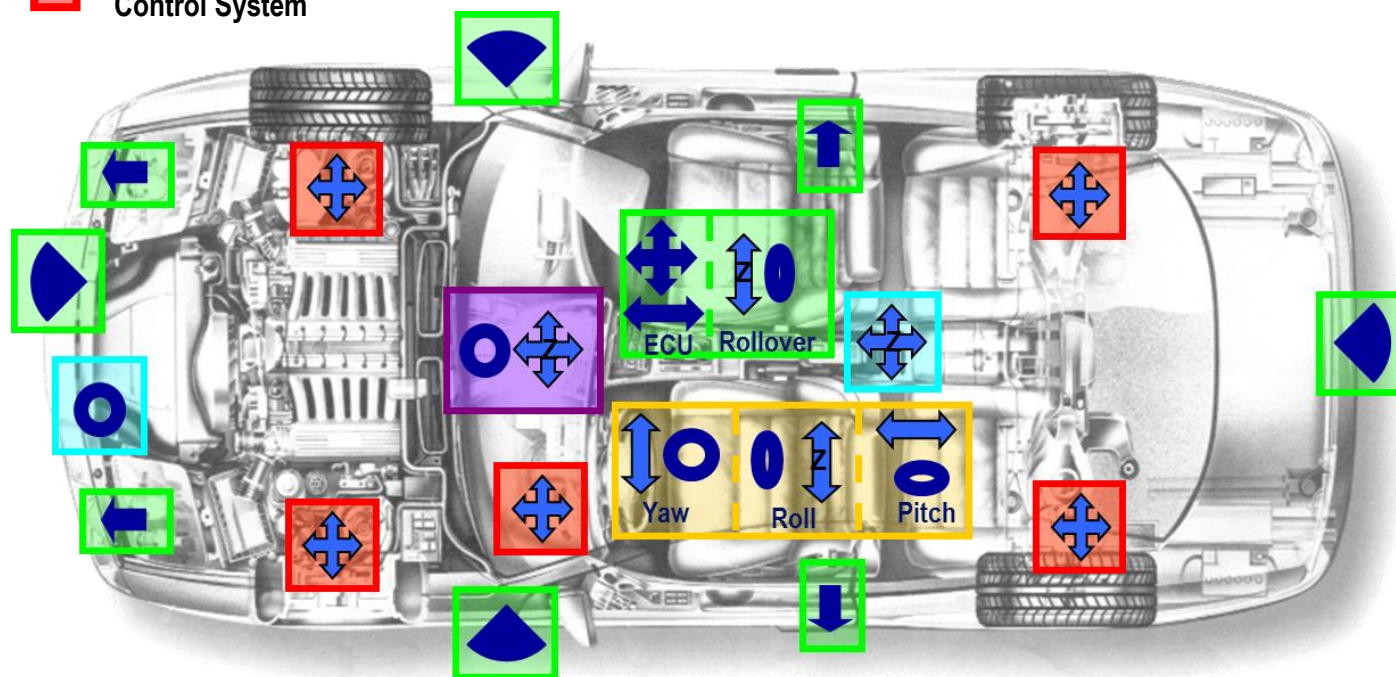
-  Crash Detection / Prevention System
-  Electronic Stability Control
-  Navigation/Driver Information System
-  Body/Chassis Control System

-  Satellite Sensor
-  Dual-axis Airbag Sensor
-  Low g Chassis Control Sensor

ADXL50

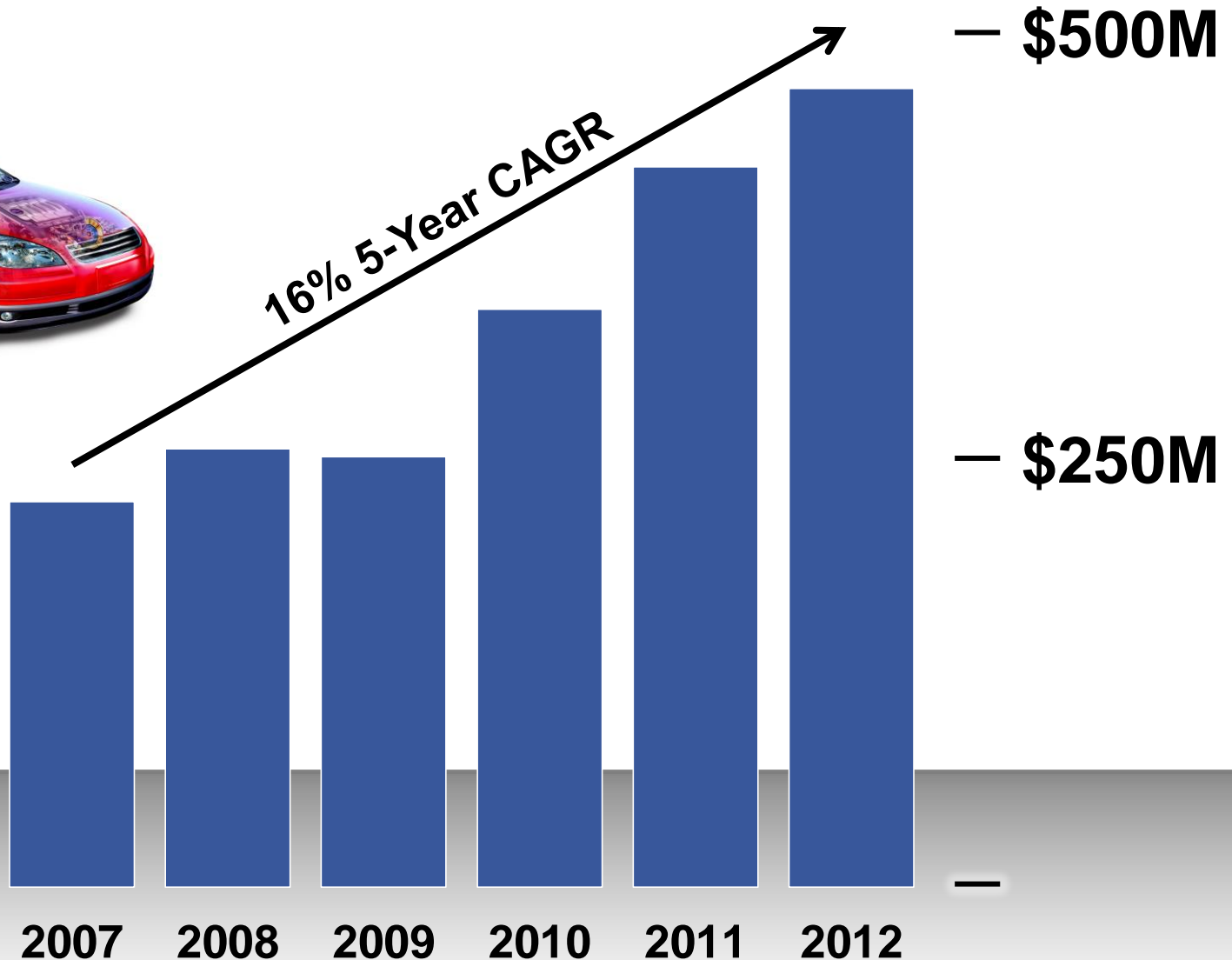


1991
1st Monolithic
MEMS Airbag
Sensor



-  Pitch Gyro
-  Roll Gyro
-  Yaw Gyro
-  Airbag
-  Seatbelt Pretensioner
-  RADAR

ADI Automotive Revenue



Source: ADI Estimates



Automotive Ecosystem

Automotive Ecosystem

Consumers



>60 Car Brands



>150 Tier 1 Suppliers



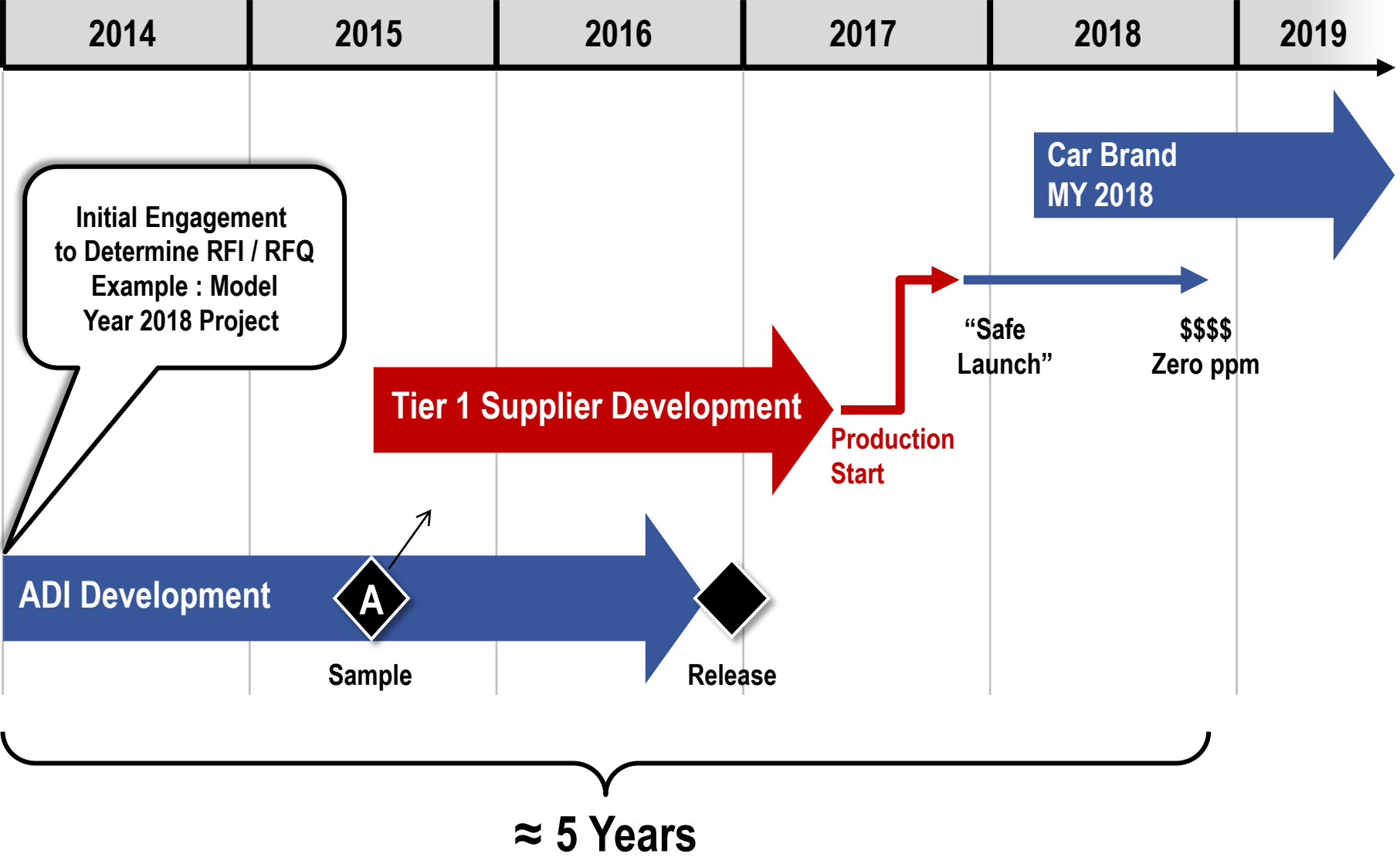
Semiconductor Innovations



Collaboration



Model Year 2018 Design Cycle



Automotive Requirements Exceed Industrial and Consumer



**Mobile
Phones**

**Industrial
Applications**

Automotive

**Typical
Life Cycle →**

1 yr

10 yrs

10 yrs

Failure Rate →

5,000 ppm

>10 ppm

1 ppm

Certified In All Major Quality Standards

World Class Automotive Quality Systems

- ◆ Prequalified Automotive Catalog
- ◆ All New Automotive ICs Adhere to AEC-Q100
- ◆ Zero Defect Management
- ◆ Technical Committee Members of Automotive Electronics Council
- ◆ Manufacturing Sites ISO/TS 16949 Certified









Government Initiatives

Government Initiatives

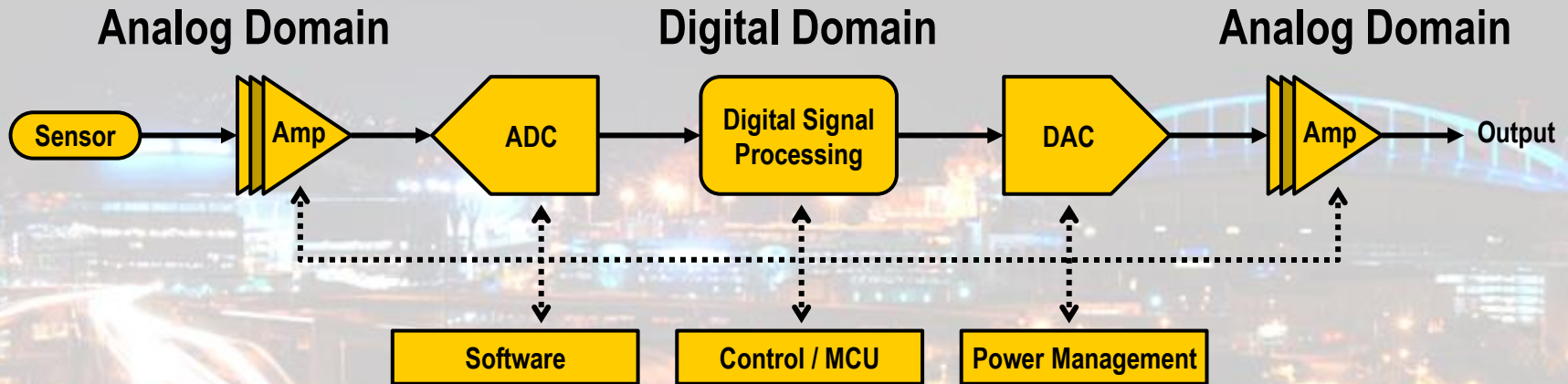


	Safer	Greener
	<ul style="list-style-type: none"> ◆ 2014 Rearview cameras ◆ 2017 Rollover prevention 	<ul style="list-style-type: none"> ◆ 2016 35.5 mpg ◆ 2025 54.5 mpg
	<ul style="list-style-type: none"> ◆ 2014 Autonomous braking ◆ 2016 Pedestrian safety systems 	<ul style="list-style-type: none"> ◆ 2014 Euro 6 emissions ◆ 2030-2050 Phased reduction of internal combustion engines
	<ul style="list-style-type: none"> ◆ 2014 ESC mandate ◆ 2014 Truck pre-crash safety system mandate 	<ul style="list-style-type: none"> ◆ Aggressive emissions targets similar to EU
	<ul style="list-style-type: none"> ◆ Centralizing regulations ◆ New safety requirements for drivers and vehicles 	<ul style="list-style-type: none"> ◆ Clean air regulations ◆ Greater use of electric vehicles ◆ Beijing and Shanghai offering clean vehicle incentives



Complex Problems, Precise Solutions

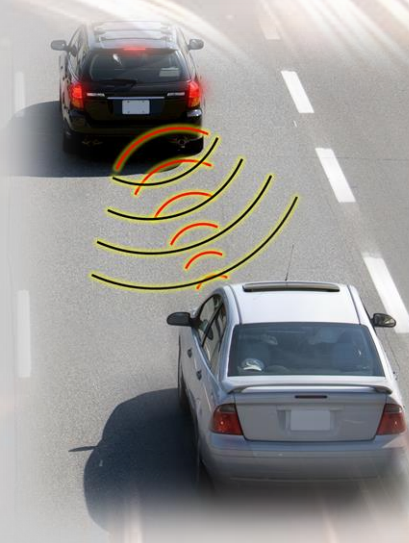
Complex Problems, Precise Solutions



Safer

Greener

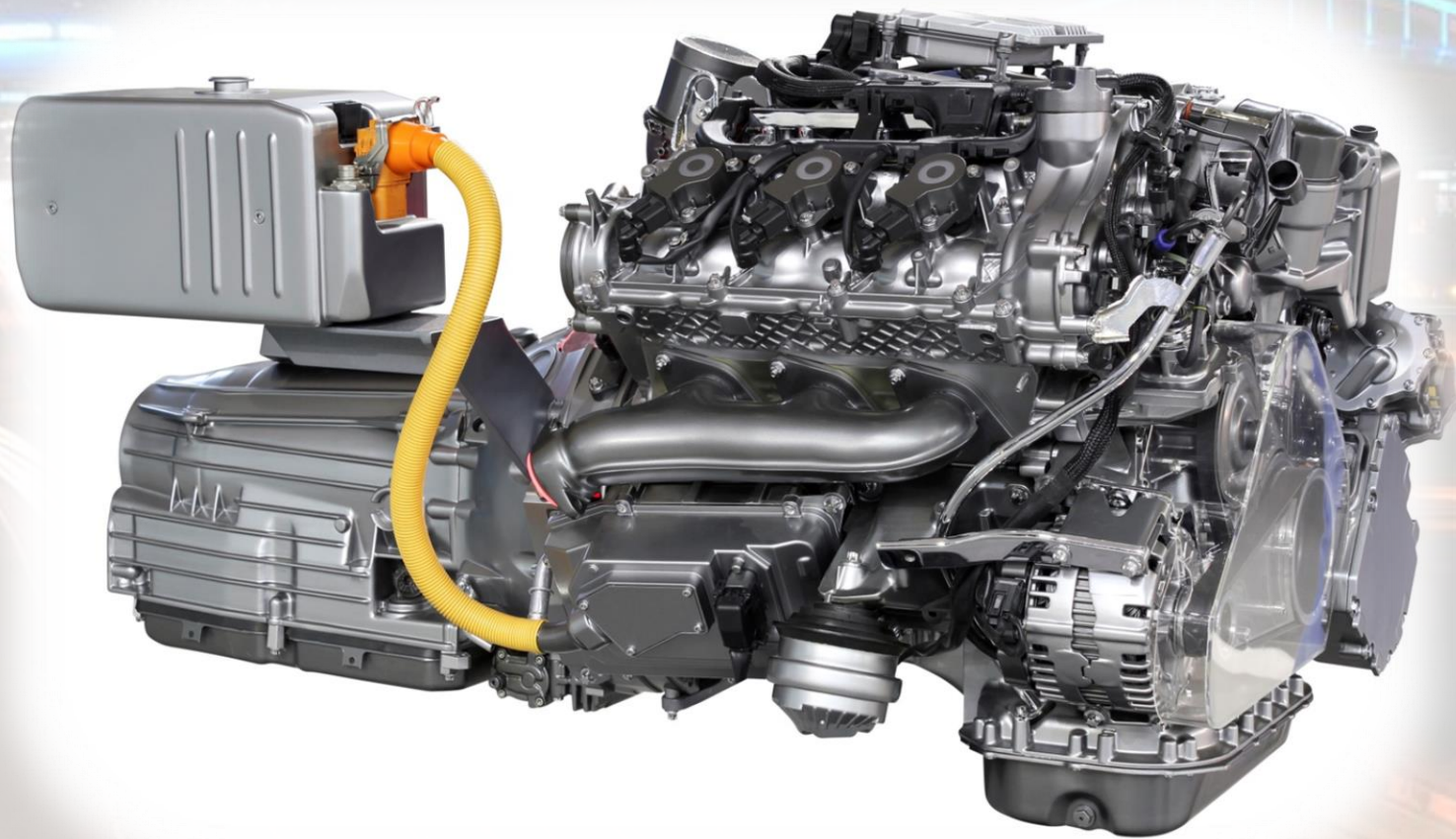
Smarter



Safer: Complex Problems, Precise Solutions



Greener: Complex Problems, Precise Solutions

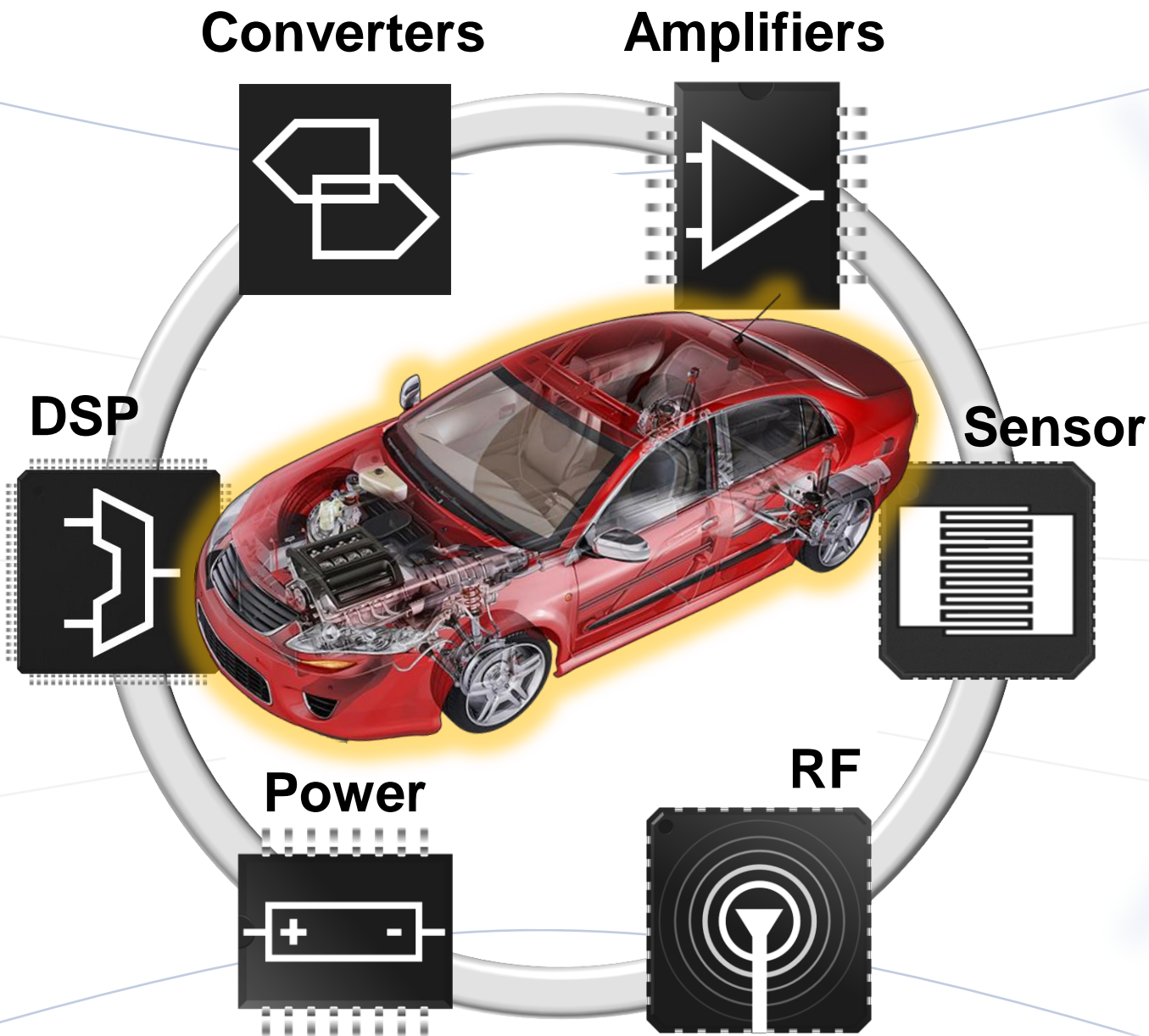


Smarter: Complex Problems, Precise Solutions

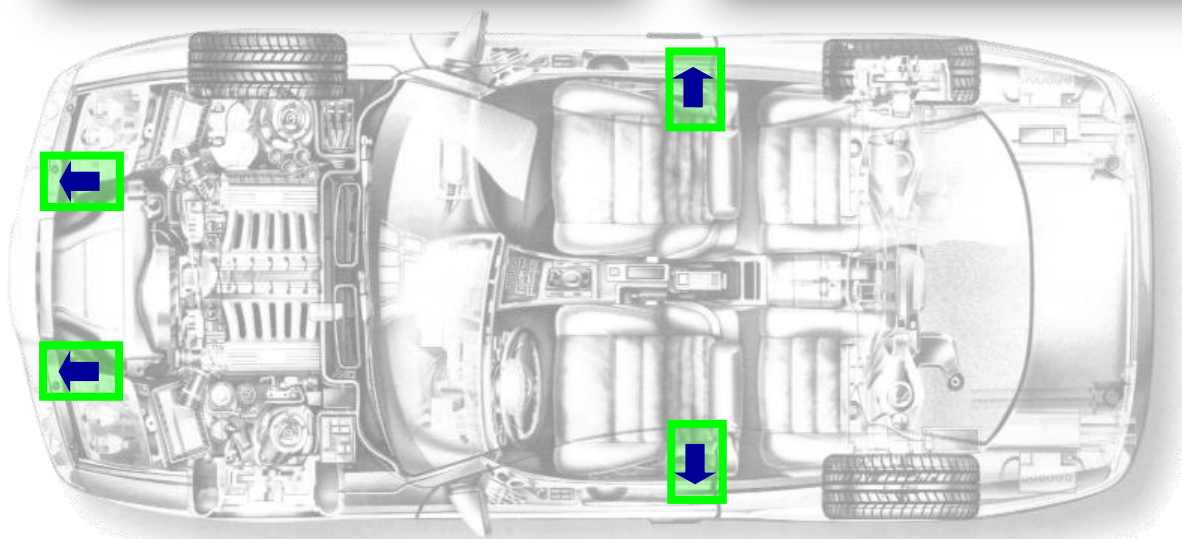




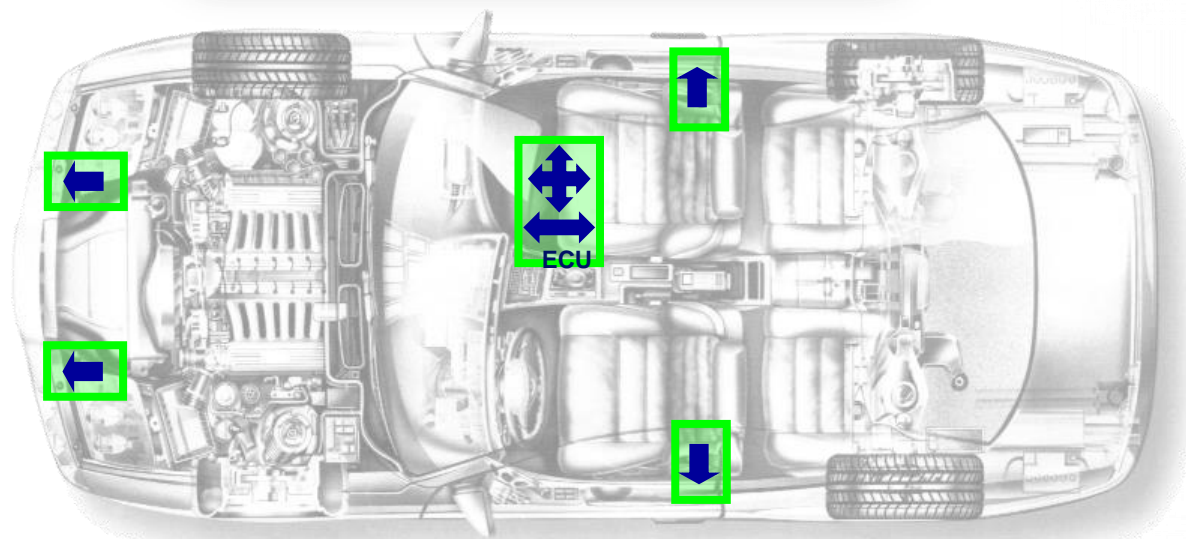
ADI Automotive Strategies



Safer: Passive Safety to **Protect** Occupants

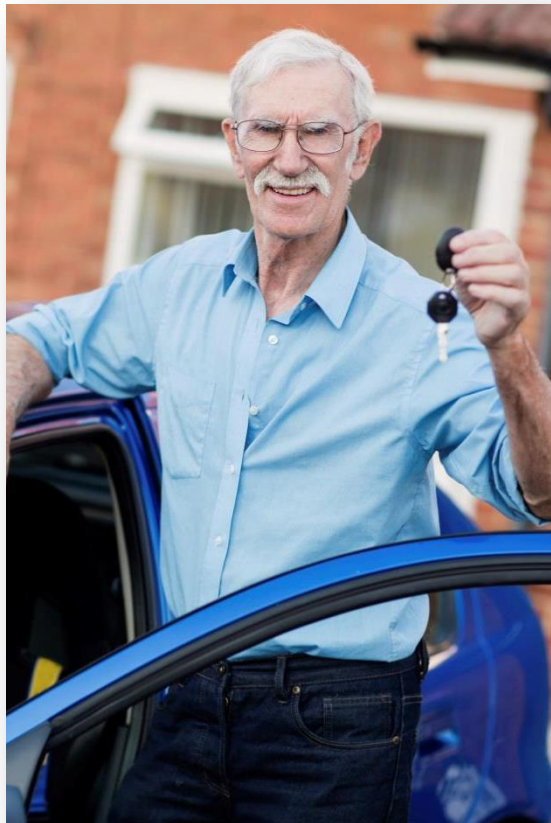


Safer: Active Safety to **Prevent** Accidents

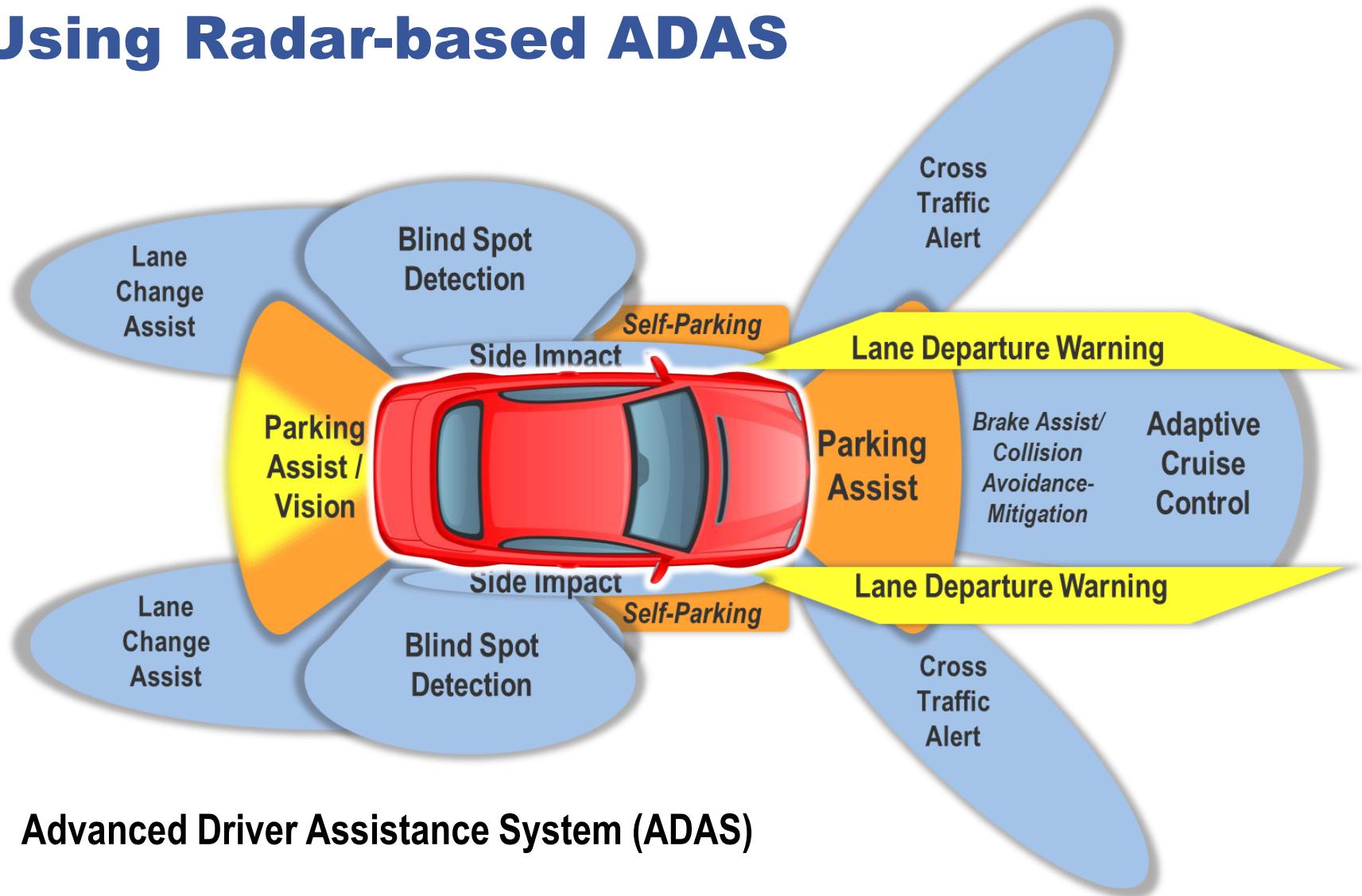


Safer: Changing Driver Demographics

- ◆ Elderly
- ◆ Distracted
- ◆ Inexperienced
- ◆ Congested



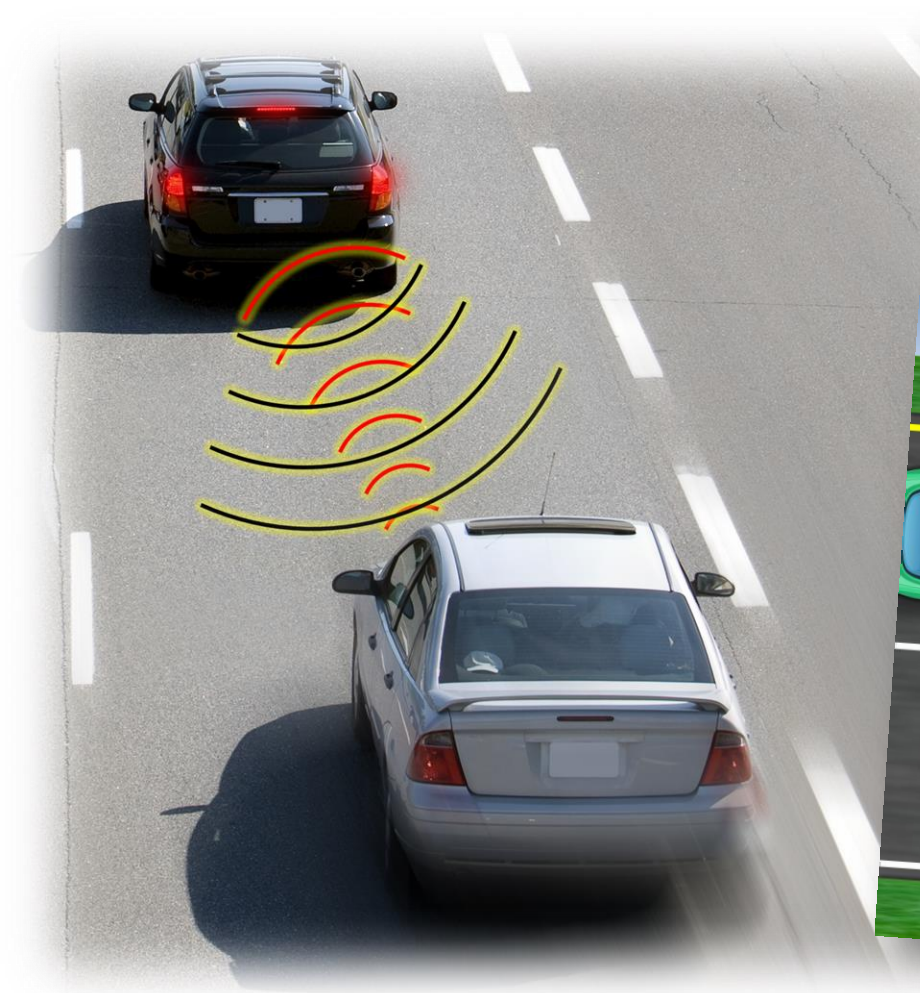
Safer: **Predict** Accidents Using Radar-based ADAS



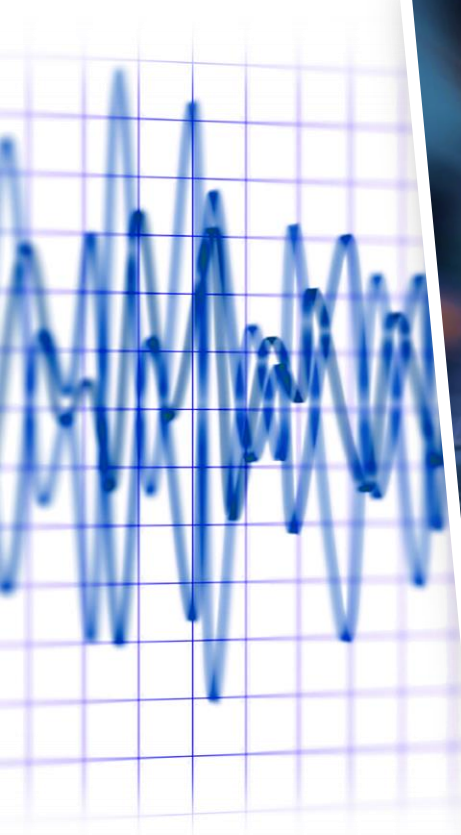
Advanced Driver Assistance System (ADAS)

Safer: **Predict** Radar Analog Front End (AFE)

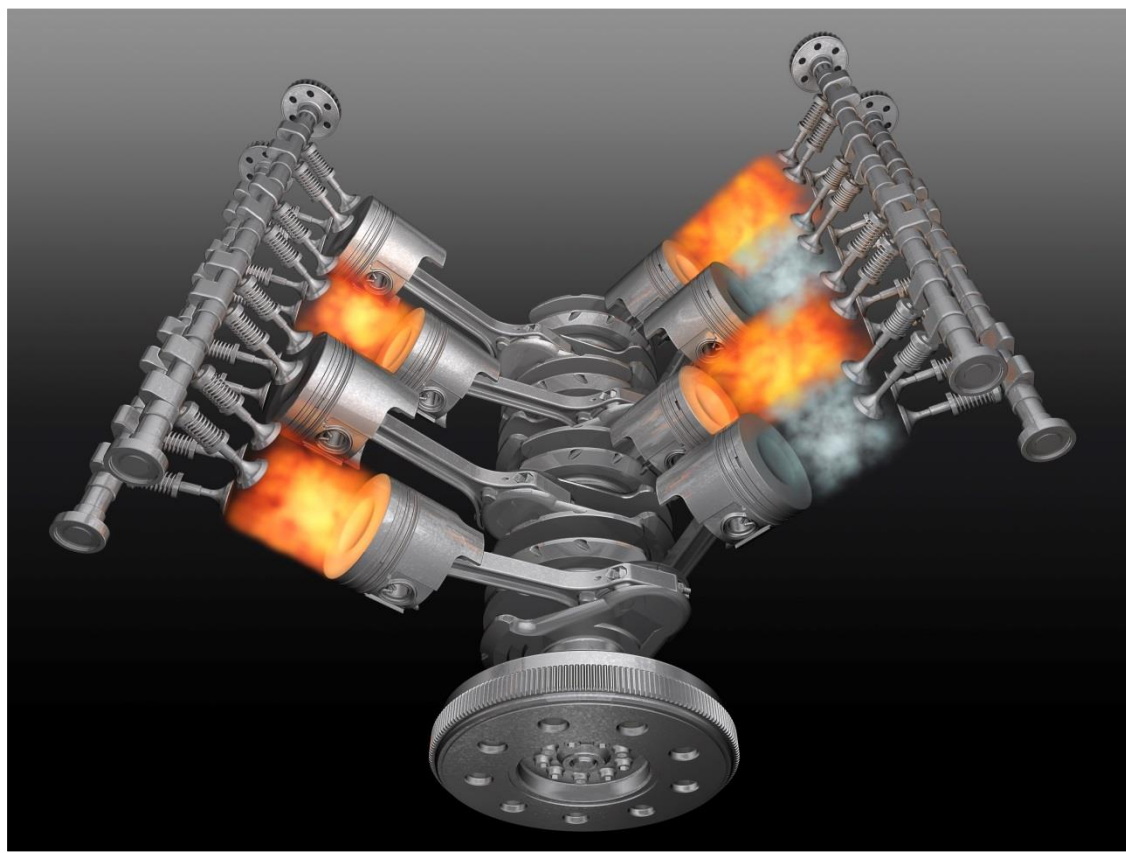
10x10mm Integrated Package



Greener: Improving Internal Combustion Engines



Greener: Improving Internal Combustion Engines



Precise Measurement and Control

- ◆ Temperature
- ◆ Position
- ◆ Pressure
- ◆ Timing

Greener: Engine Idle Start-Stop Systems



Greener: Engine Idle Start-Stop Systems



Integrated, Precision Battery Sensor for Automotive Systems

ADuC7039

Data Sheet

FEATURES

High precision ADC
Dual channel, simultaneous sampling, 16-bit, $\Sigma\Delta$ ADCs
Programmable ADC throughput from 10 Hz to 1 kHz
On-chip 5 ppm/ $^{\circ}\text{C}$ voltage reference
Current channel
Fully differential, buffered input
Programmable gain
ADC input range: -200 mV to $+300\text{ mV}$
Digital comparator with current accumulator feature
Voltage channel
Buffered, on-chip attenuator for 12 V battery input
Temperature channel
External and on-chip temperature sensor options
Microcontroller
ARM7TDMI-S core, 16-/32-bit RISC architecture
20.48 MHz PLL
On-chip precision oscillator
JTAG port supports code download and debug

Memory

64 kB Flash/EE memory options, 4-kB SRAM
10,000-cycle Flash/EE endurance, 20-year Flash/EE retention
In-circuit download via JTAG and LIN
On-chip peripherals
SAE J2602/LIN 2.1-compatible slave
SPI
GPIO port
1 \times general-purpose timer
Wake-up and watchdog timers
On-chip power-on-reset

Power

Operates directly from 12 V battery supply
Current consumption 7.5 mA (10 MHz)
Low power monitor mode
Package and temperature range
32-pin, 6 mm \times 6 mm LFCSP
Fully specified for -40°C to $+115^{\circ}\text{C}$ operation
Qualified for automotive applications

APPLICATIONS

Battery sensing/management for automotive

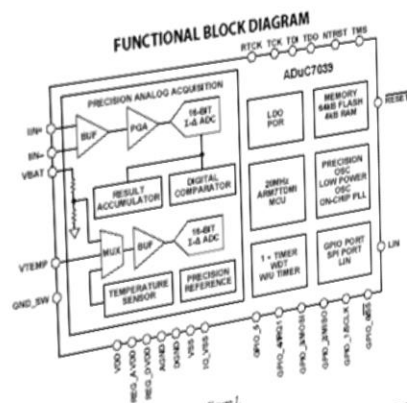
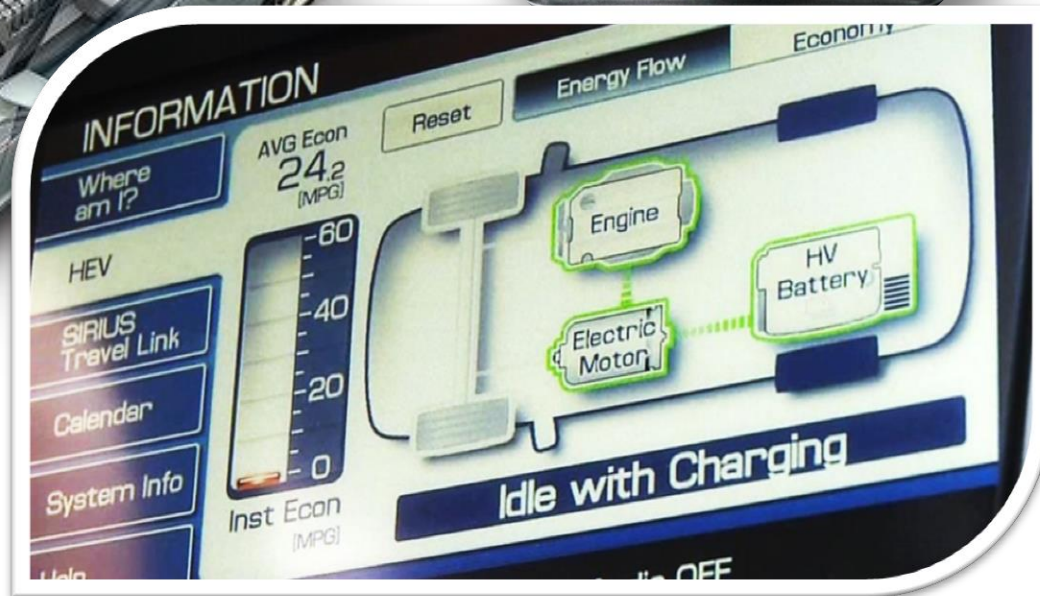


Figure 1.



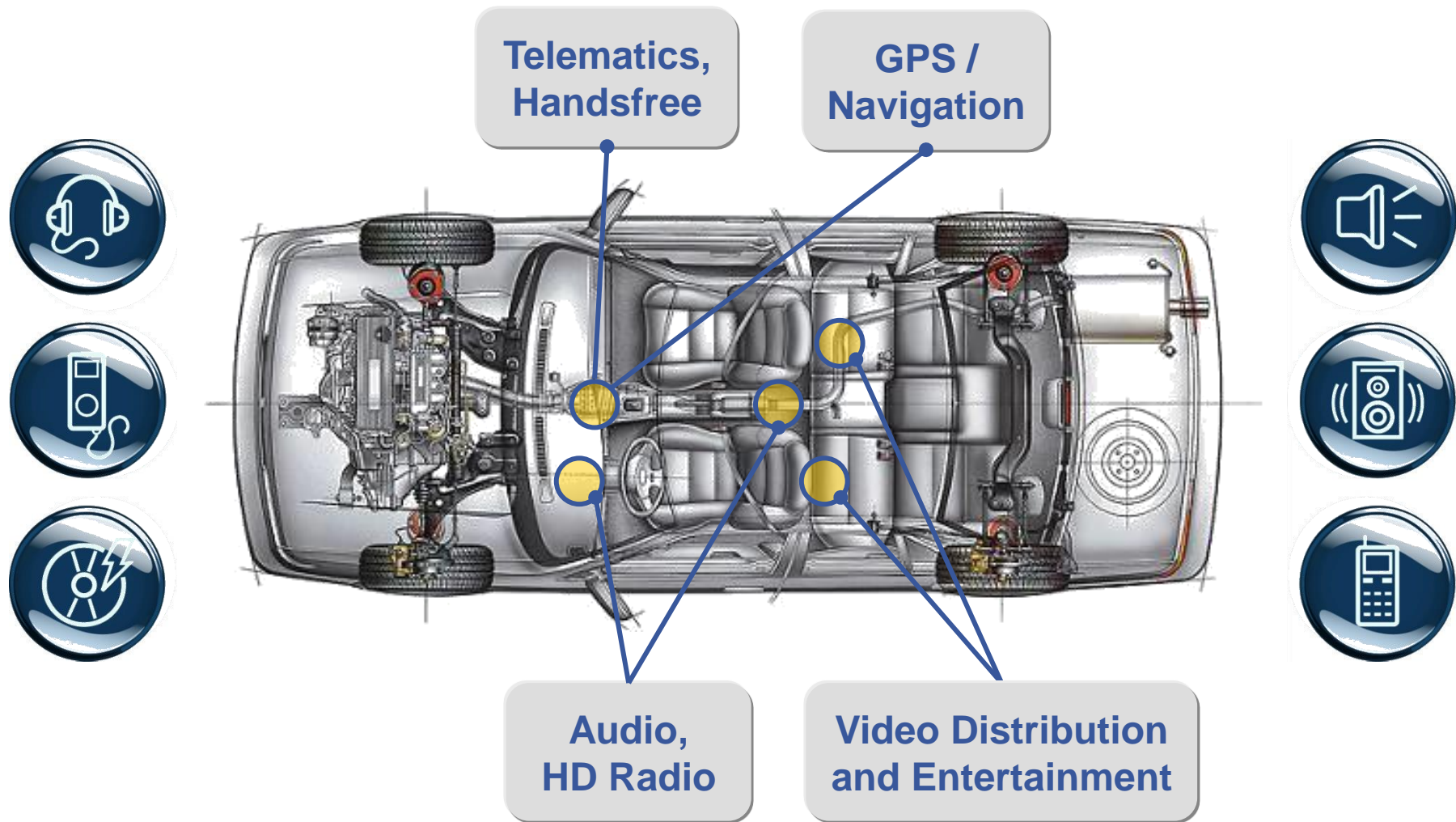
ADuC7039

Greener: Battery Monitoring for Hybrid and Electric Vehicles



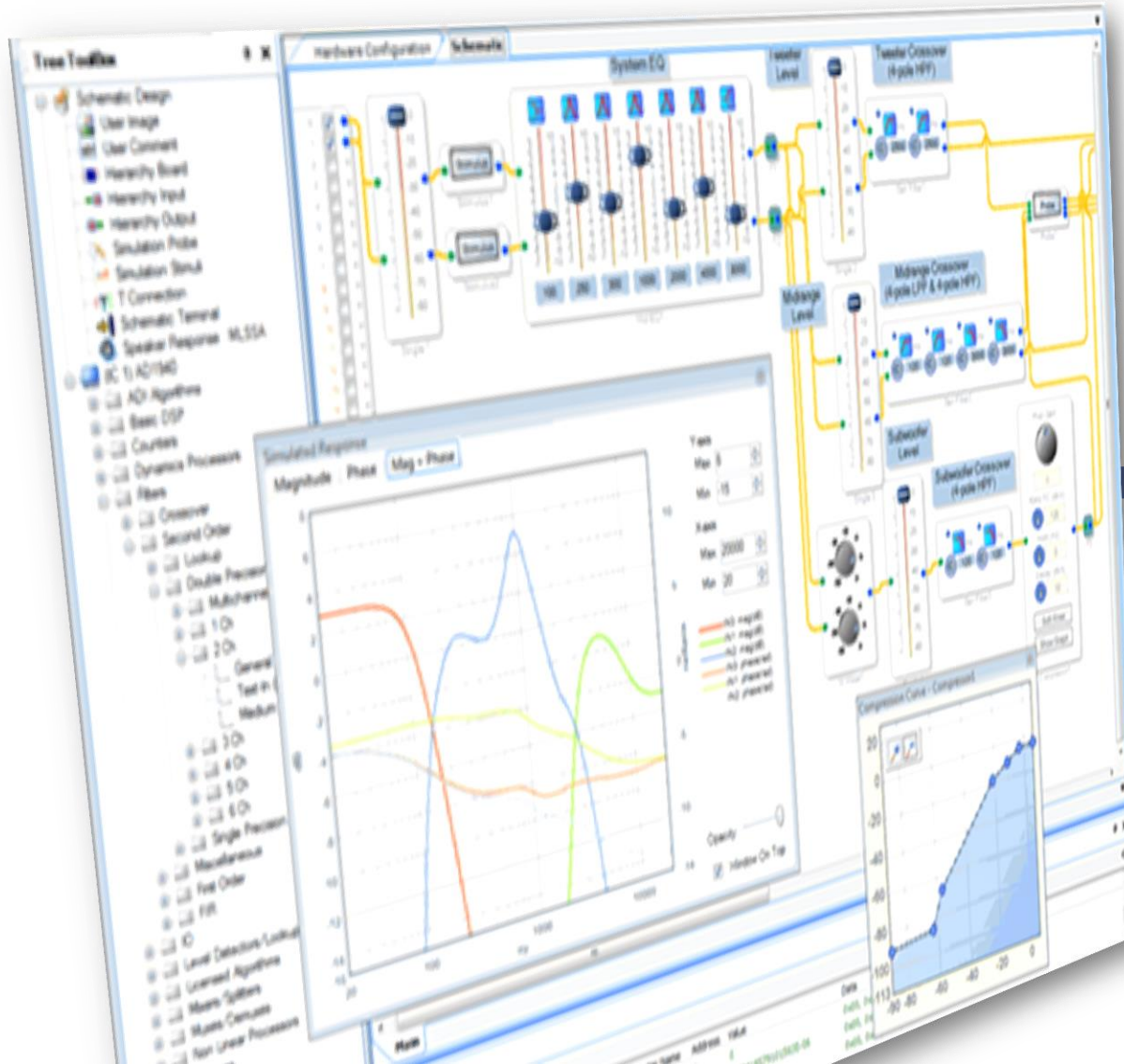
- ◆ Integrated ARM[®] microcontrollers

Smarter: Infotainment



Smarter: High Fidelity Audio Processing

SigmaStudio™ Graphical Audio Optimization Tool and DSP



Smarter: Real-Time Optimization Adapts Audio to the Driving Environment



Smarter: Premium Audio Experiences Provide Differentiation Among Brands

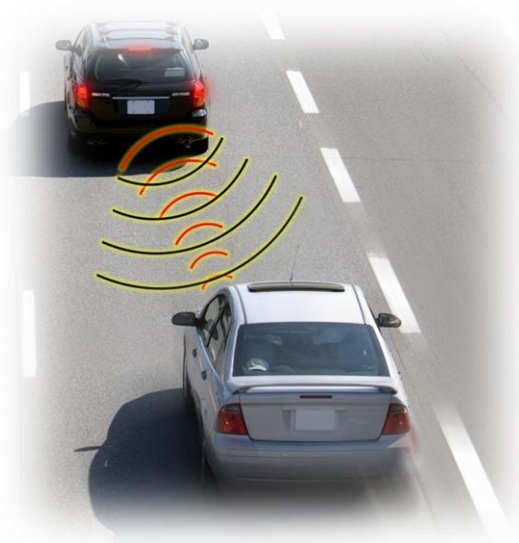




Safer

Greener

Smarter



Growth of ADI's Automotive SAM



— \$9B

— \$6B

— \$3B



2010

2015

2020

2025

Growth Driven by Confluence of Factors

- ◆ Increasing electronic content per vehicle
- ◆ Accelerating vehicle unit growth
- ◆ Technology as a differentiator in premium brands
- ◆ Proliferation in mass market cars to meet government initiatives





ADI Is Making Tomorrow's Cars Better

2010+

2015 +


2020 +



**Stability
Control**

**Accident
Prevention**

**Zero
Accidents**



**Higher
Efficiency**

**Flexible
Energy
Sources**

**Zero
Emissions**



Comfortable

Smart

**Connected
Intelligence**

ADI Automotive Opportunity



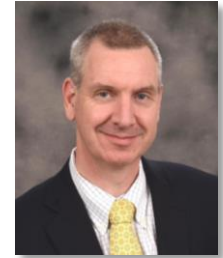
High precision signal processing technology is enabling & advancing trends of safer, greener, smarter vehicles



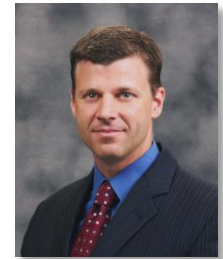
ADI combines circuit, systems, and process know-how to achieve industry leading precision under harsh conditions



ADI's served available market is doubling approximately every 5 years, reaching \$5B in 2020



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