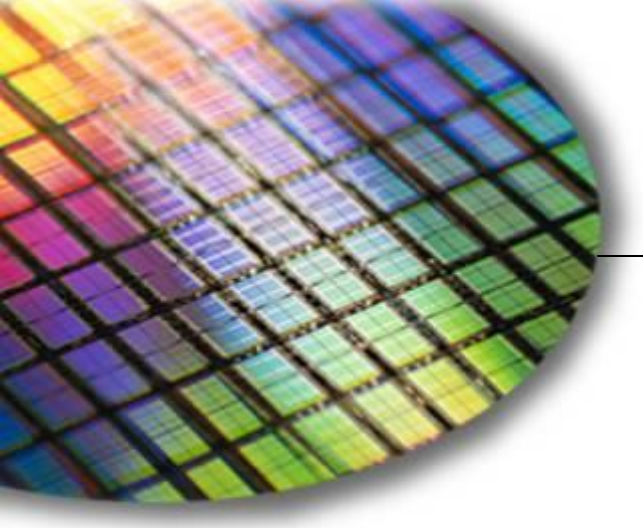


The World Leader in High Performance Signal Processing Solutions

MEMS Webcast

October, 2013

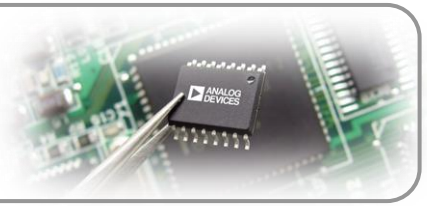
ANALOG DEVICES

High Performance Inertial Sensors

Sensor Trends

Growth Opportunities

Products & Technology



Submit Your Questions Online At Anytime During the Webcast

Mark Martin
VP, MEMS / Sensors

David A. Zinsner
VP Finance & CFO

Maria C. Tagliaferro
Director of Corporate Communications

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Worldwide Sensor Industry: Rapid Expansion

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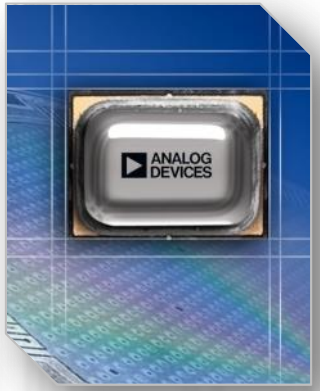
Sensing Real-world Phenomena

Temperature

Pressure

Motion

Sound



Light

RF

Proximity

Voltage/Current

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Applications Integrating Sensors

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Trend: Energy Efficiency and Environmental Protection

ANALOG DEVICES

Trend: Safety and Security

Trend: Healthcare Costs of Aging Population

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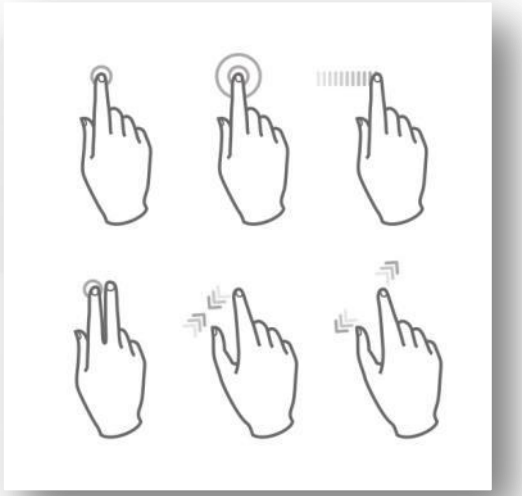
Trend: Enhancement of User Experiences



Worldwide Sensor and Sensor-Based Instruments Market

Source: Frost and Sullivan

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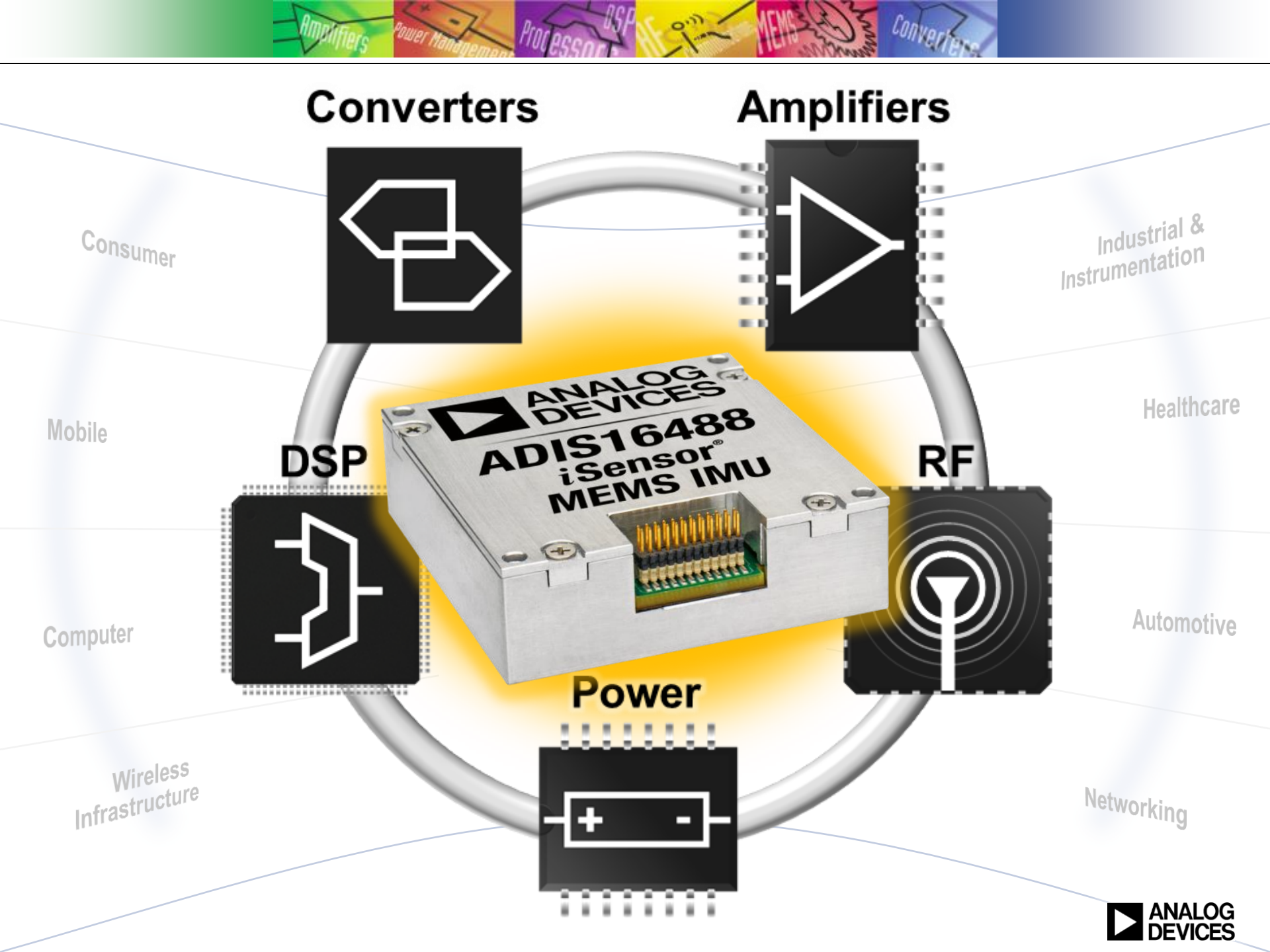
ADI High Performance Signal Processing

ANALOG DEVICES


Converters
Amplifiers
DSP
RF
Power
ANALOG DEVICES
ADIS16488
iSensor®
MEMS IMU
Consumer
Mobile
Computer
Wireless Infrastructure
Industrial & Instrumentation
Healthcare
Automotive
Networking
ANALOG DEVICES

ADI High Performance Sensor Opportunity

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How MEMS Semiconductors Work

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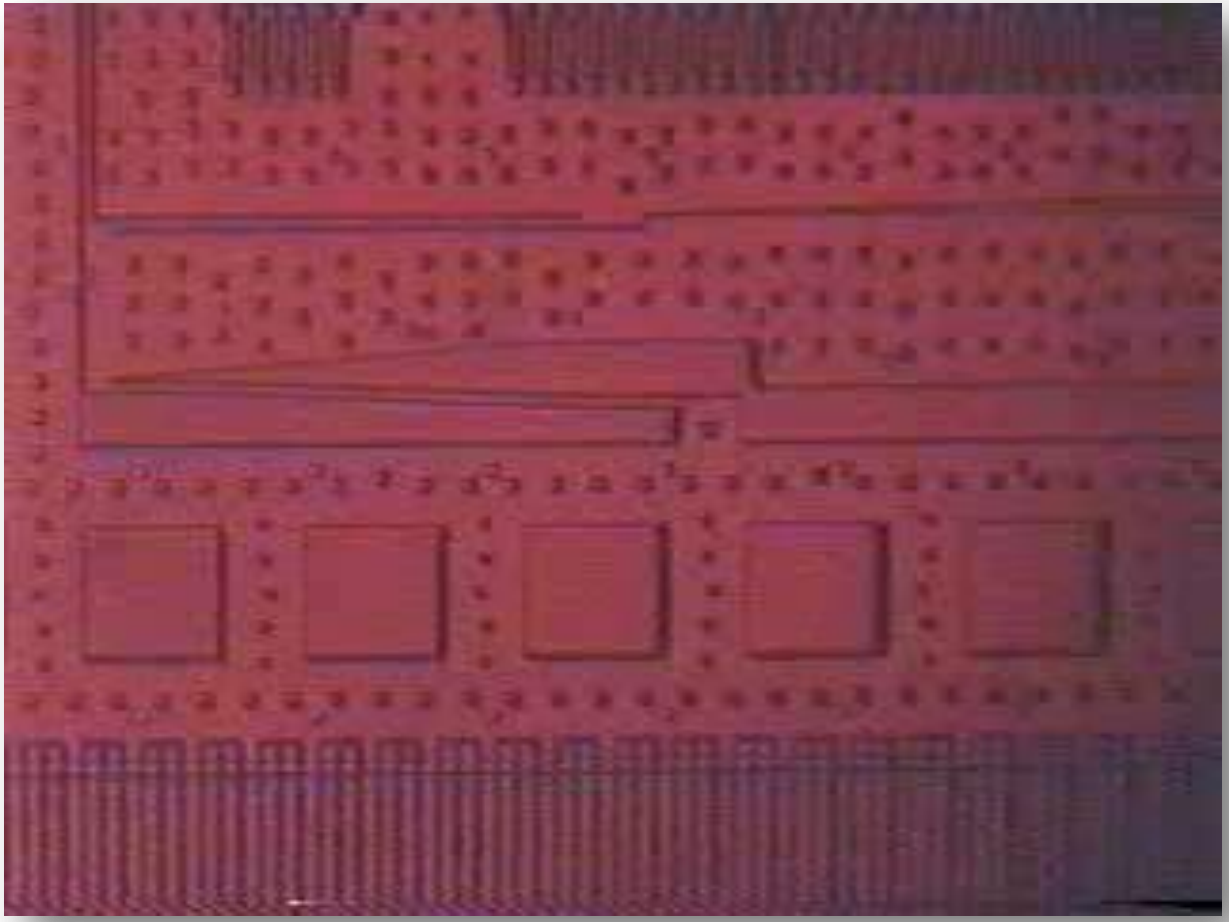
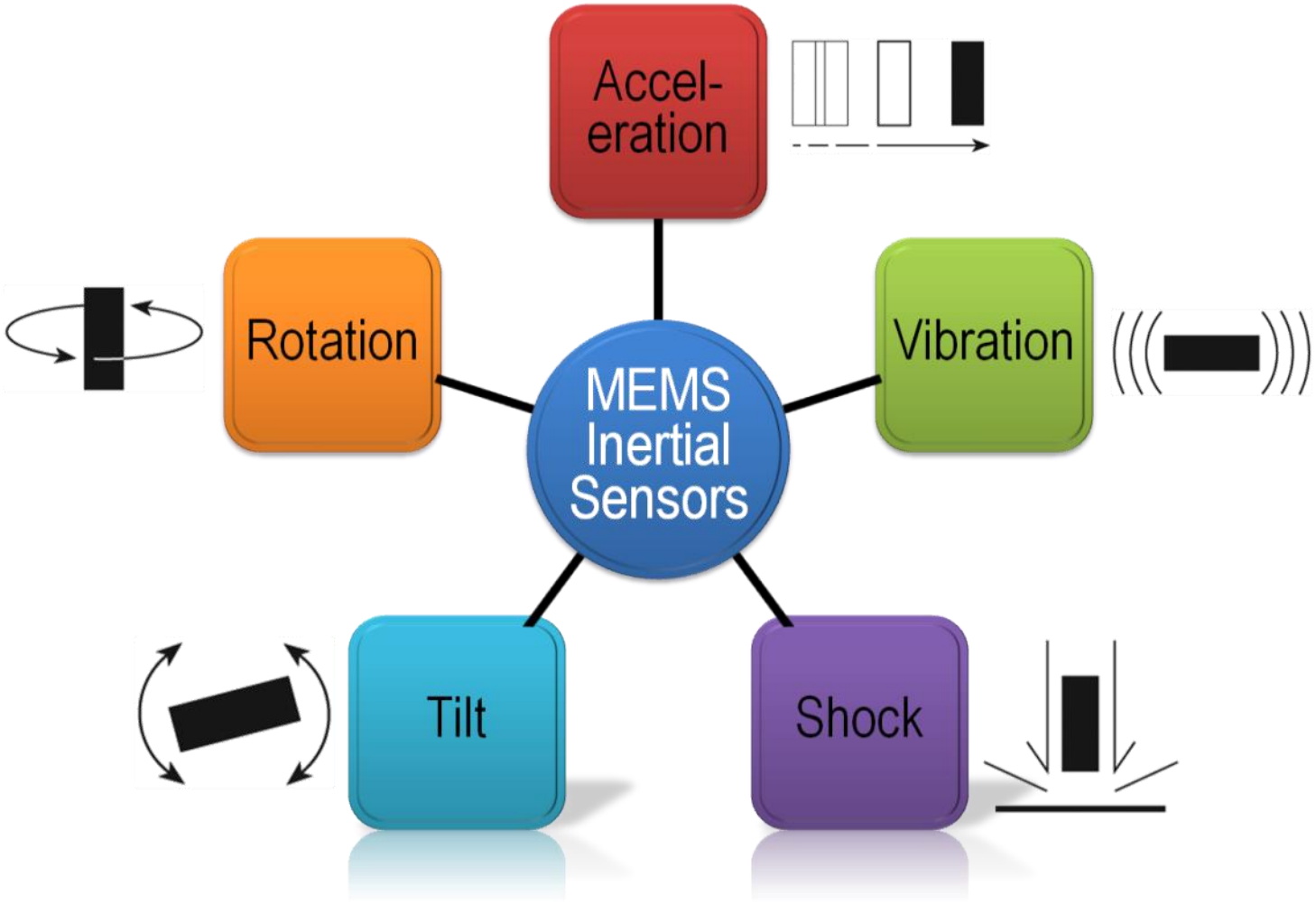
Micro-Electro-Mechanical System

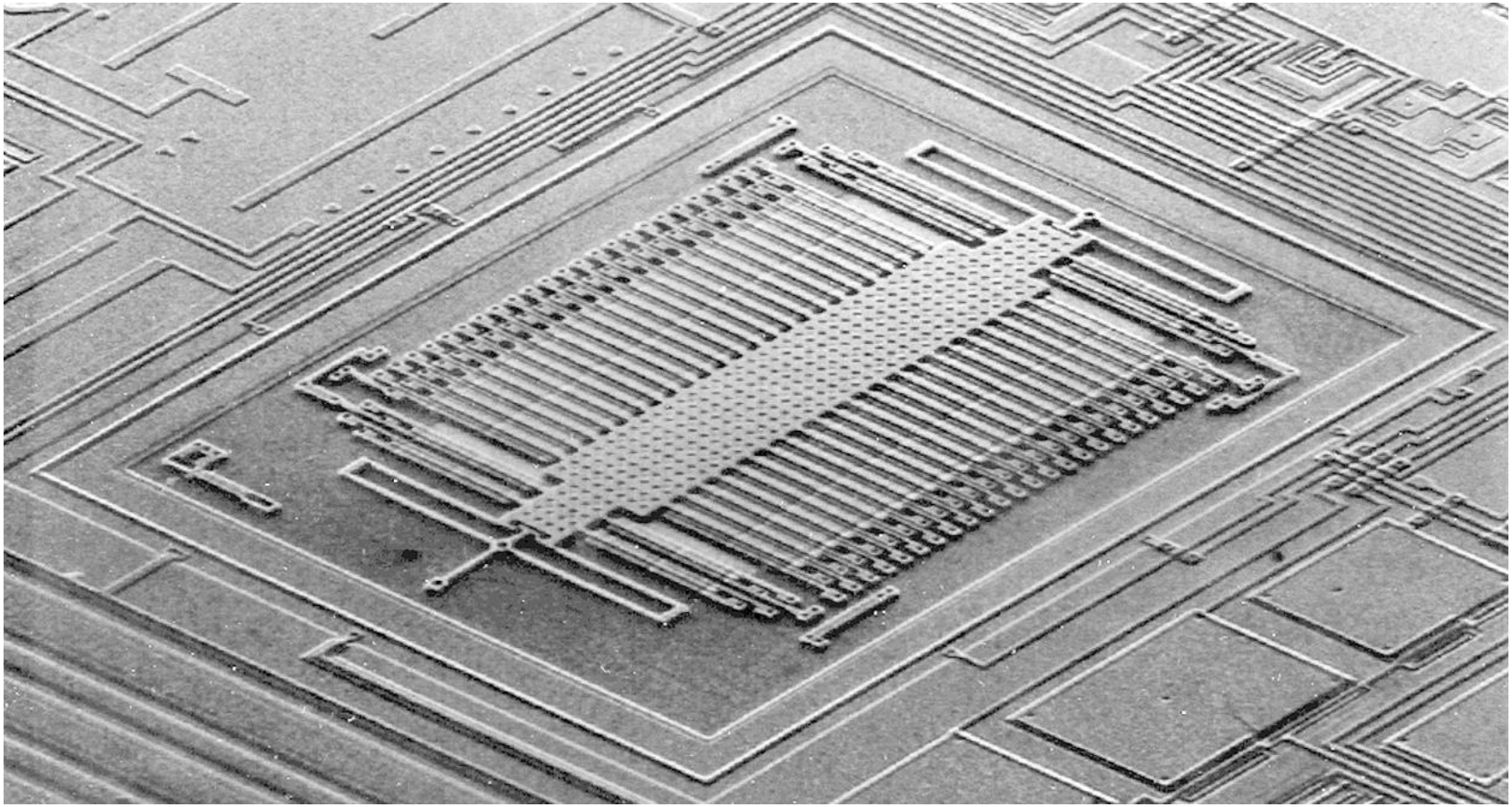


Microscopic view of MEMS motion

ANALOG DEVICES


Accel-
eration
Rotation
MEMS
Inertial
Sensors
Vibration
Tilt
Shock

ADI MEMS Sensor Microscopic View



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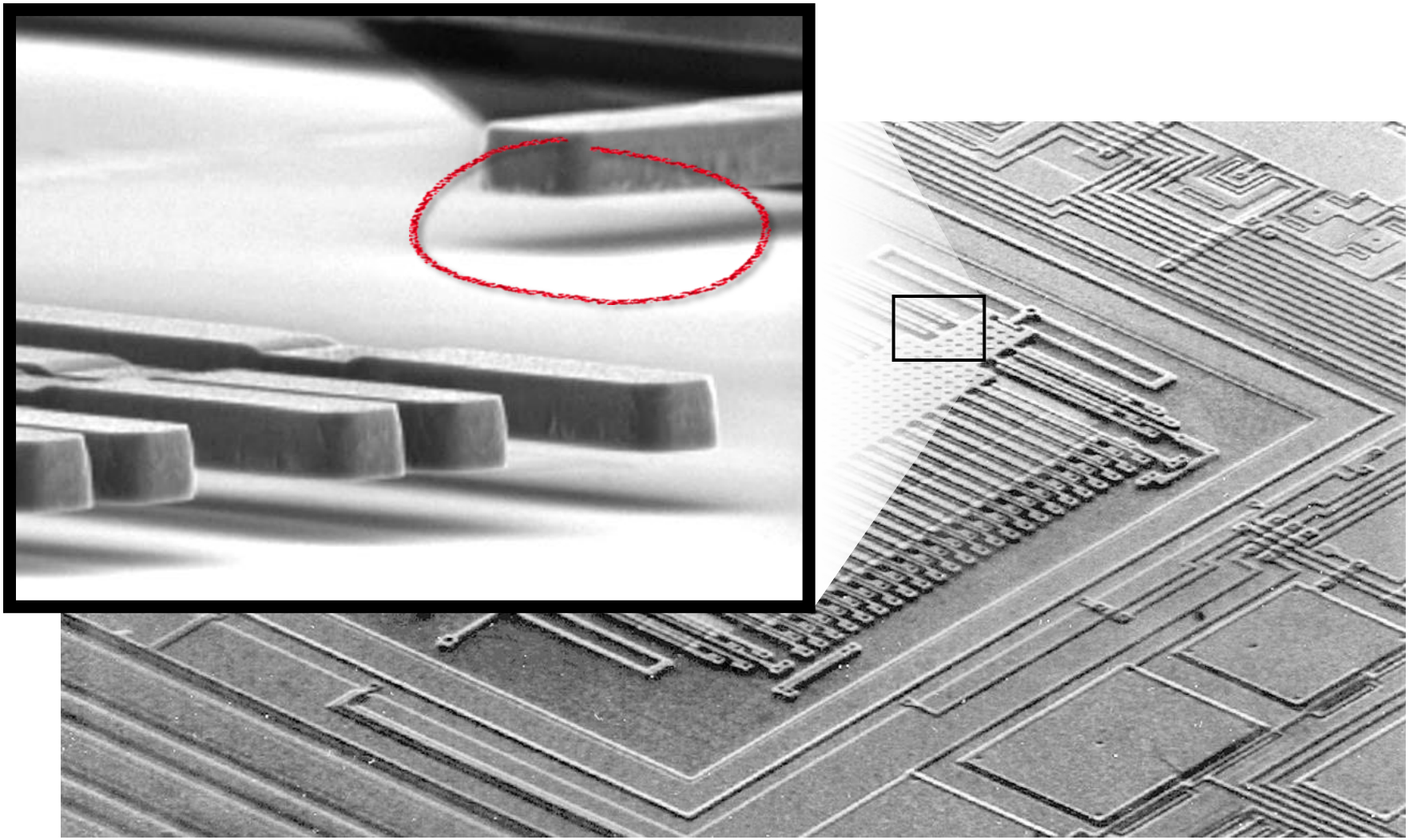
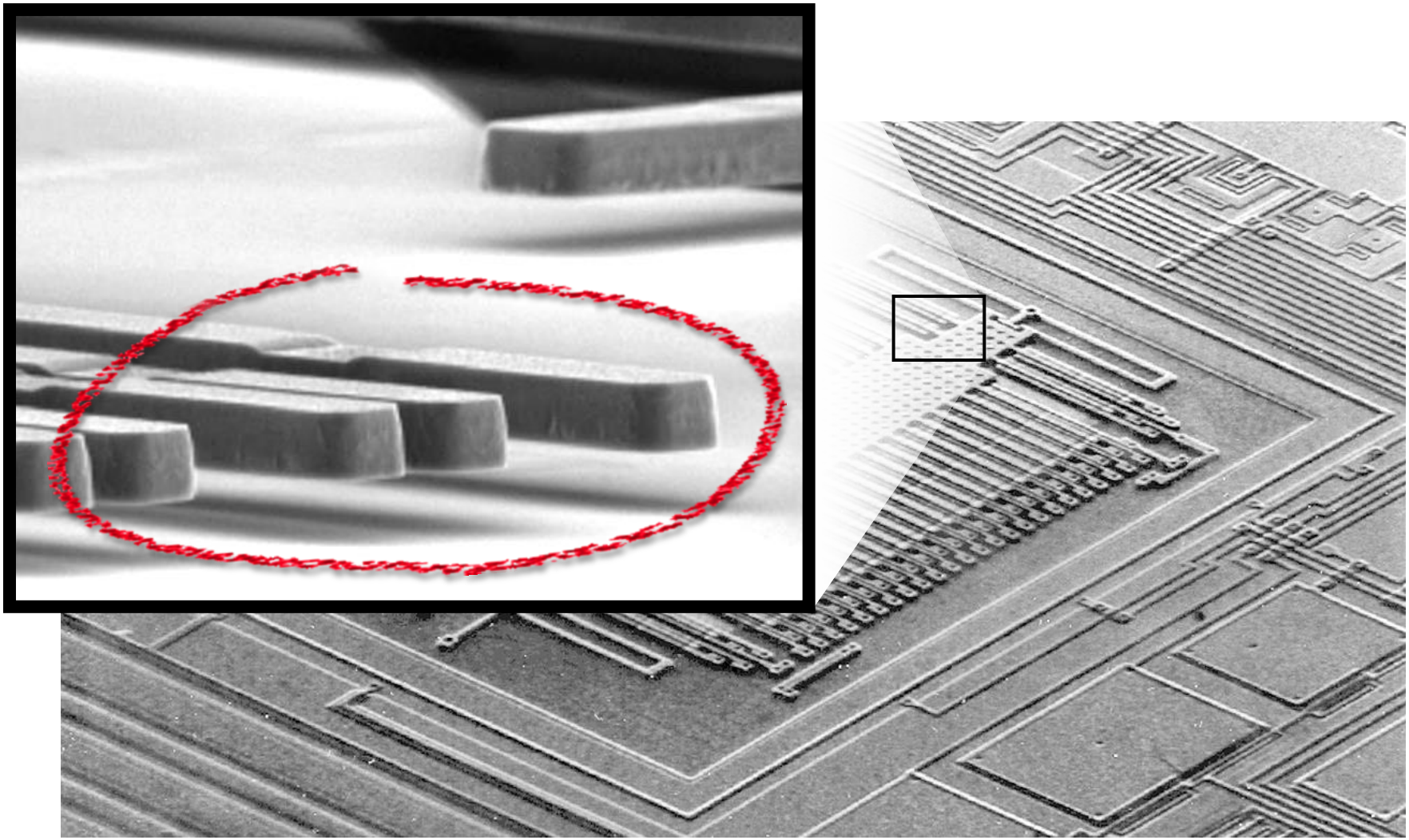
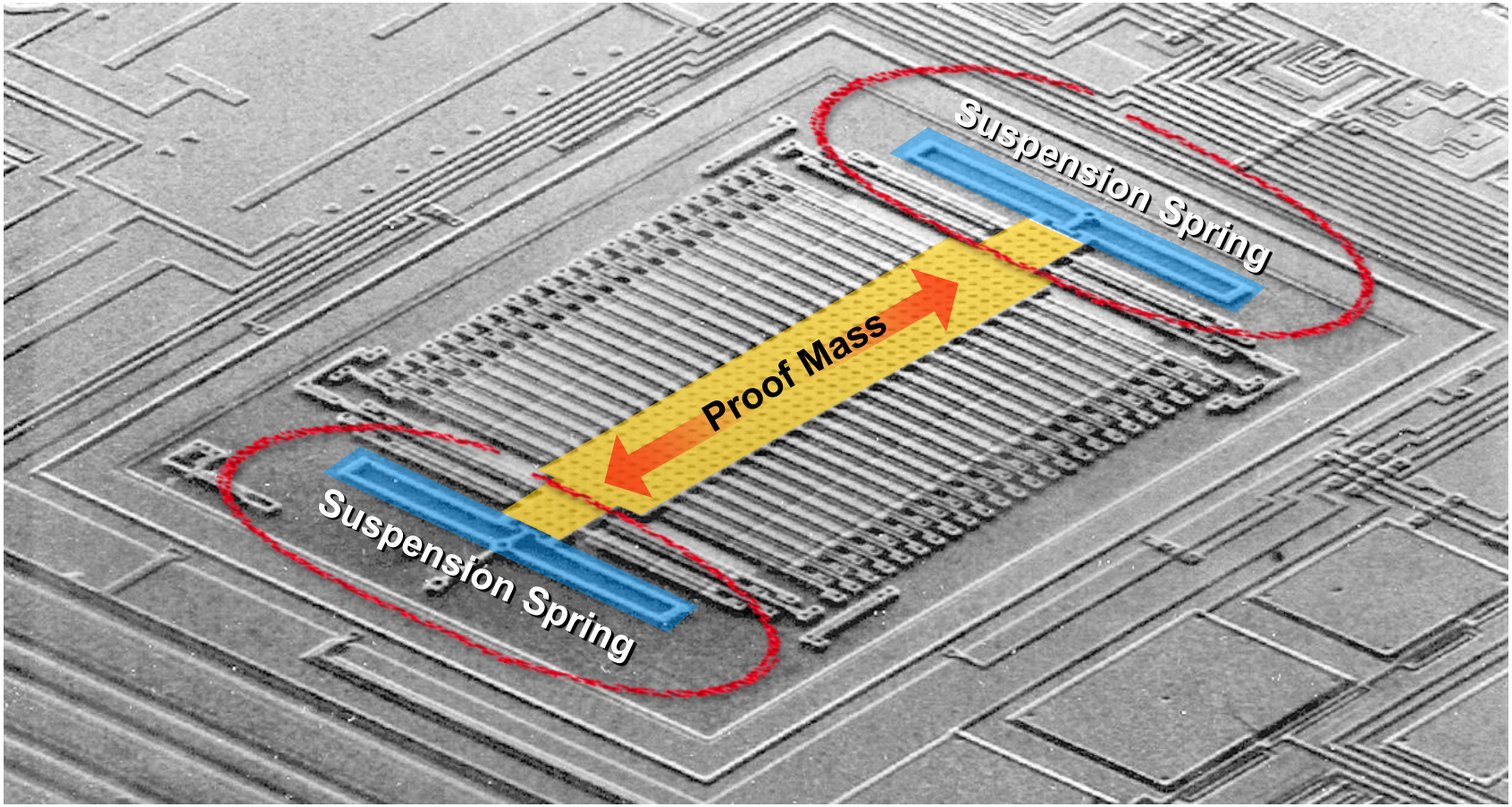
ADI MEMS Sensor Microscopic View



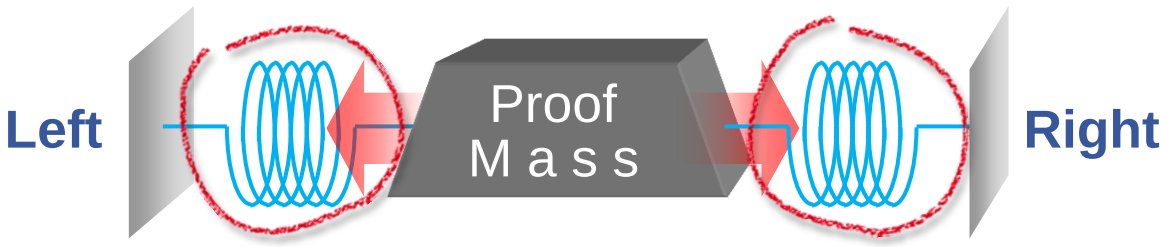
Proof Mass

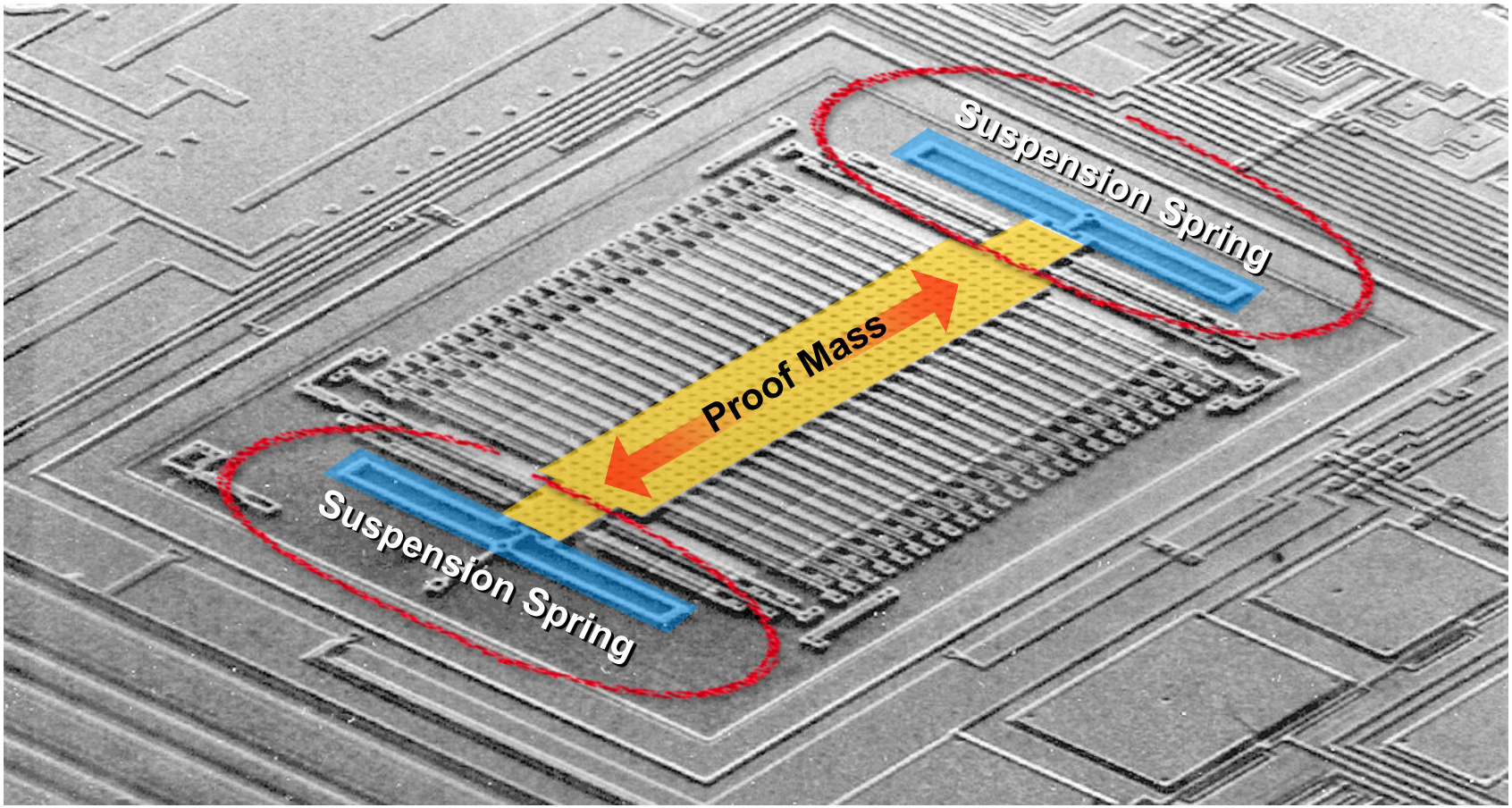


Suspension Springs



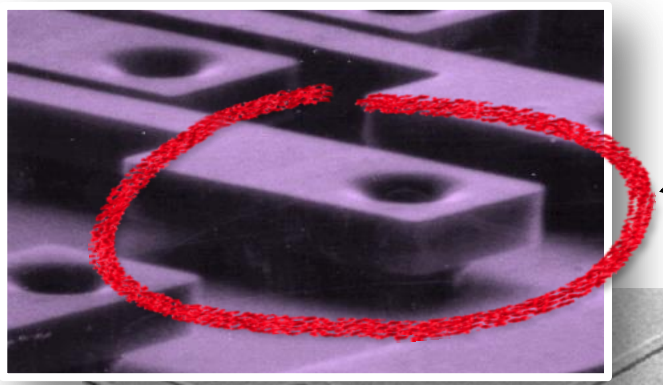
Suspension Springs



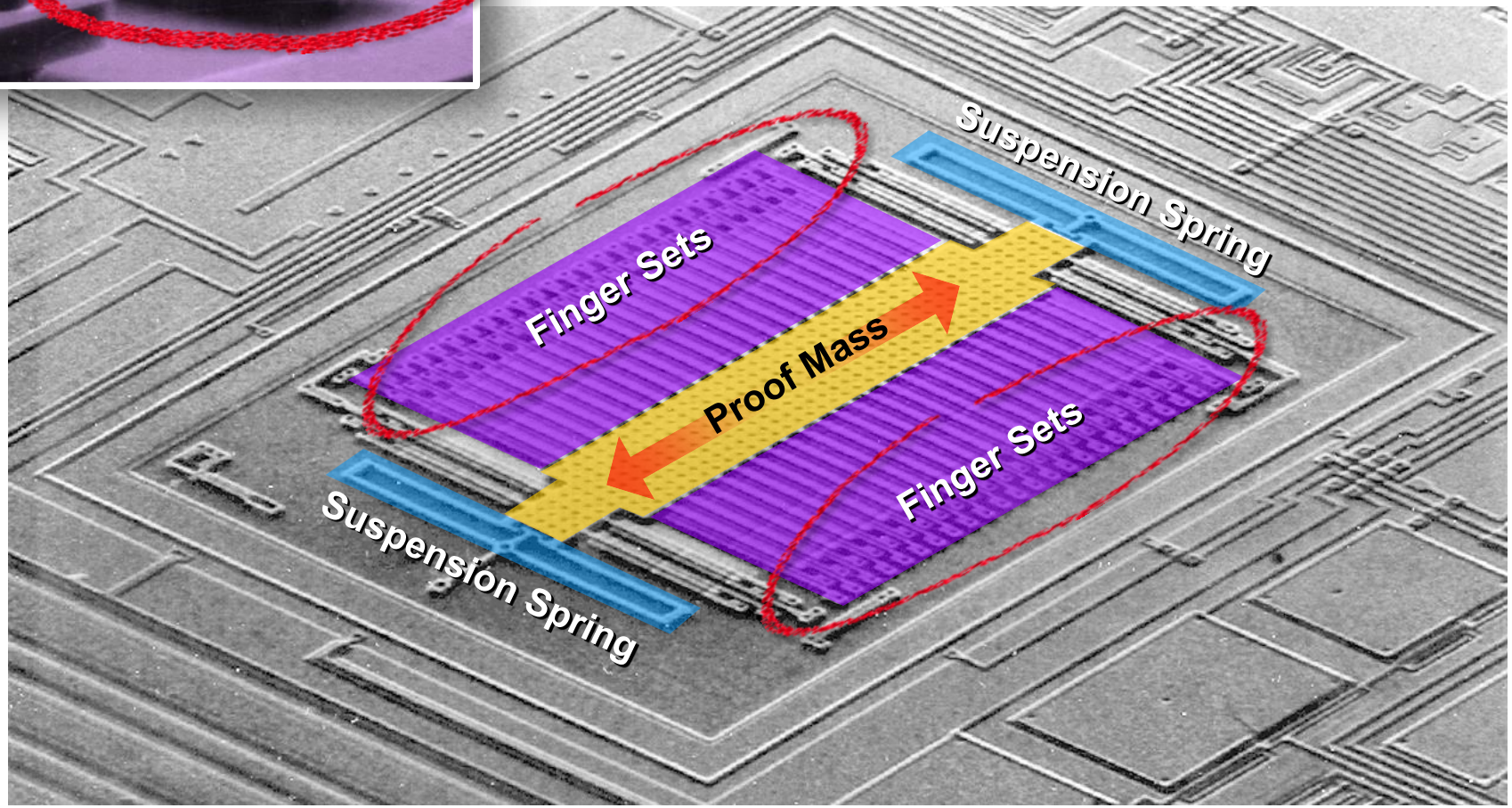


ANALOG DEVICES

Finger Sets



Fingers



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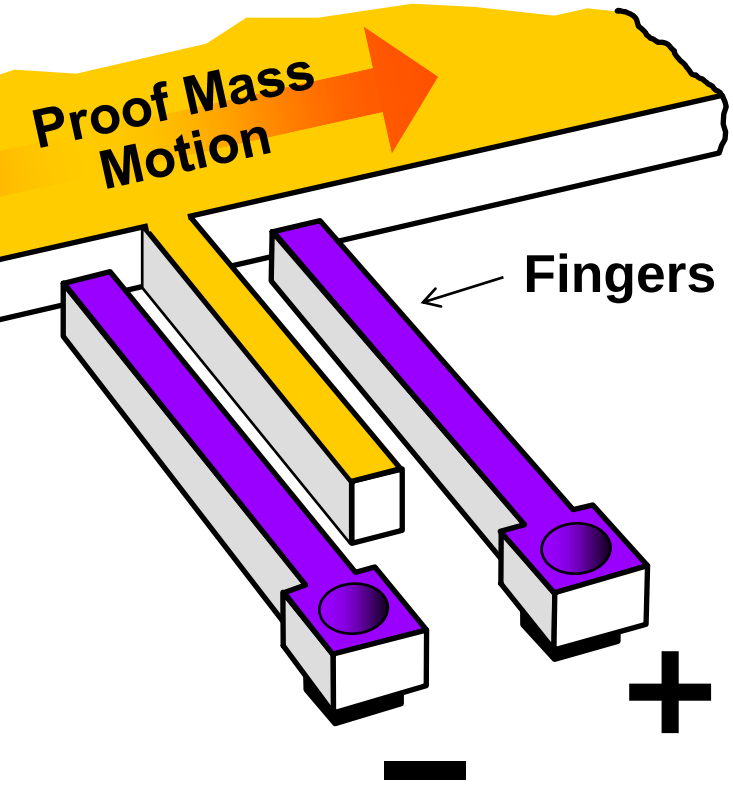
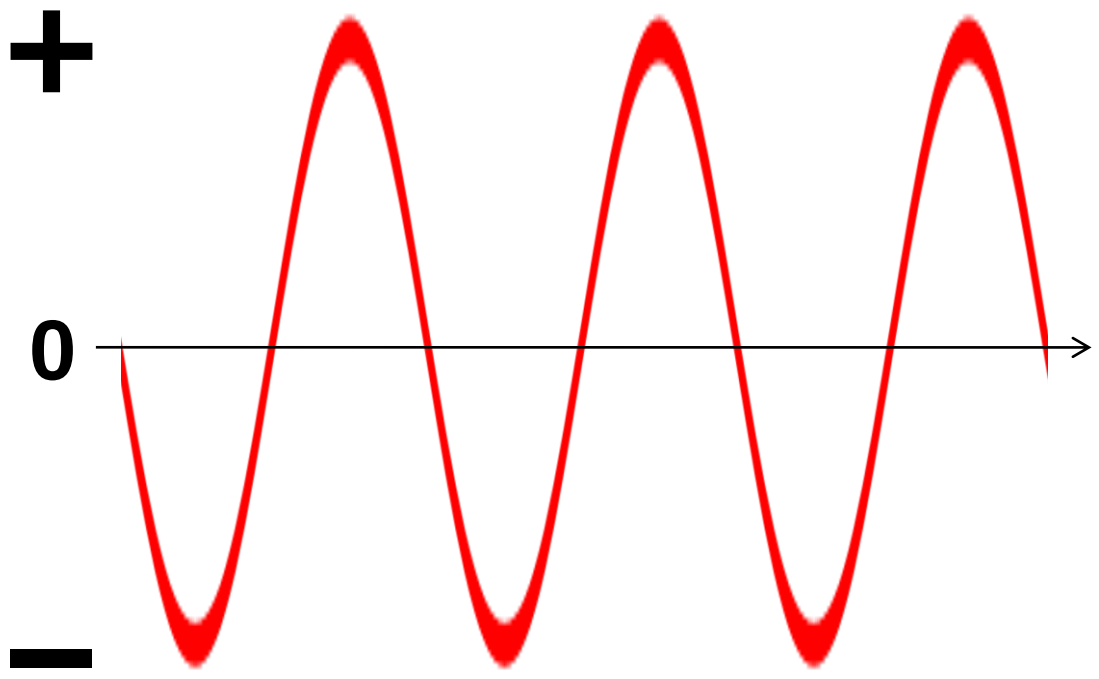
Change In Finger Gap Generates Signal





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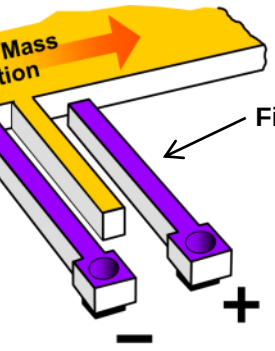
Engineering the Full Sensor Signal Chain

Analog Domain

Digital Domain



Output of Application-Ready Motion Data

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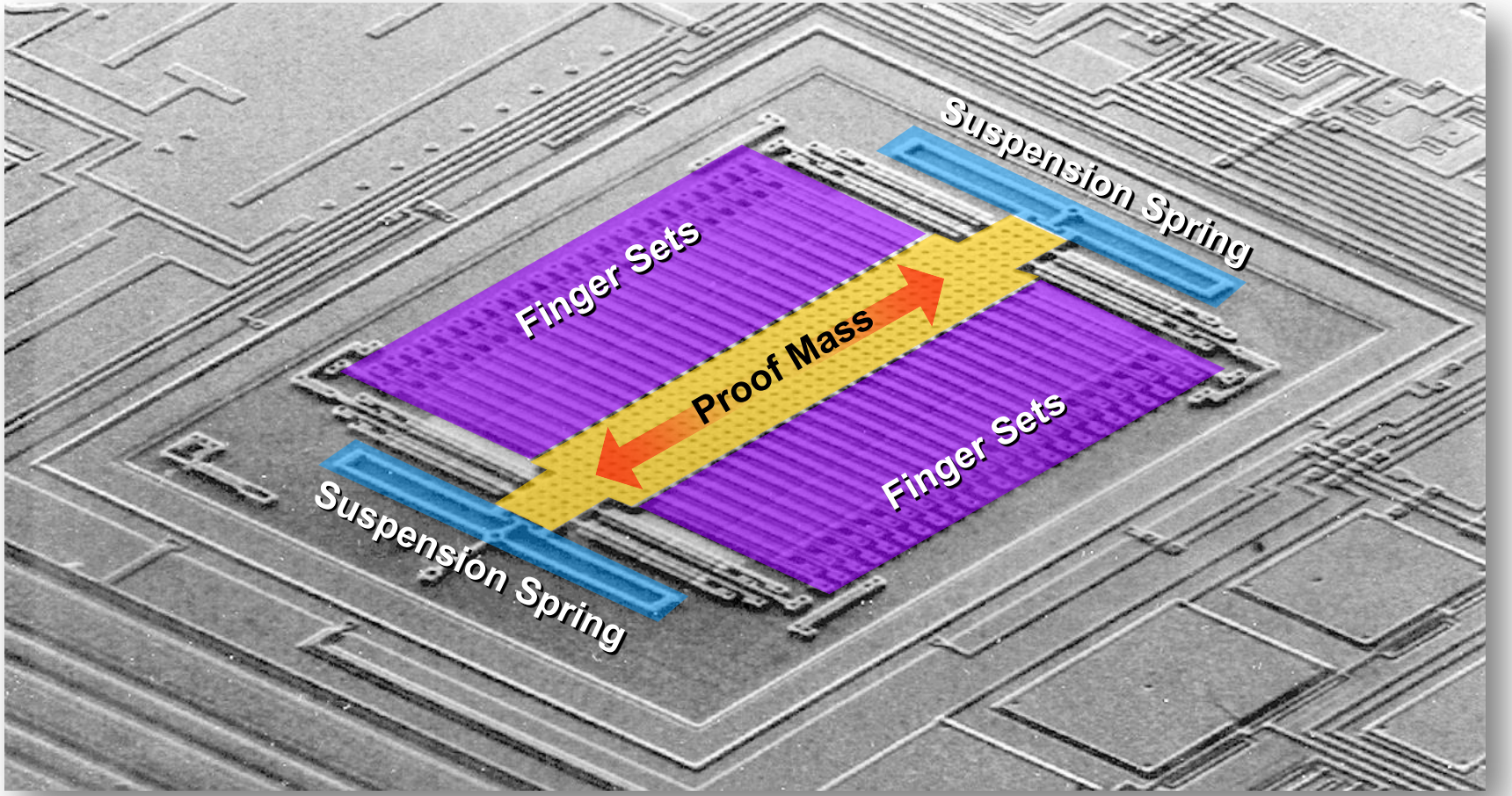
Micro-Electro-Mechanical System



Over 25 Years of MEMS Expertise

Circuits **Manufacturing** **Test** **Calibration** **Packaging**

Bits	Description (Default = 0
[15:11]	Not used.
[10:8]	Measurement range (sensi
	100 = ±14,000°/sec, filter ta
	010 = ±7000°/sec, filter tap
	001 = ±3500°/sec, filter tap
[7:3]	Not used.
[2:0]	Number of taps in each sta

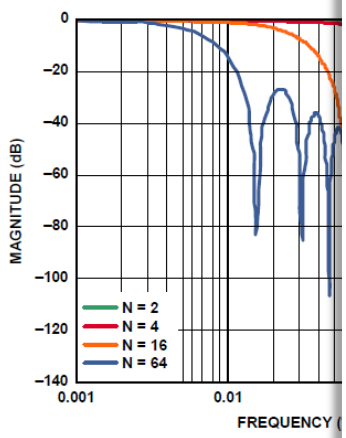


Figure 18. Digital Filter Frequency, Bo
(Phase = N Samp

DYNAMIC RANGE

The SENS_AVG[10:8] bits provide thr
for this gyroscope. The lower dynamic r
and ±7000°/sec) limit the minimum fi
resolution. For example, set SENS_AV

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Commercialization of MEMS Devices

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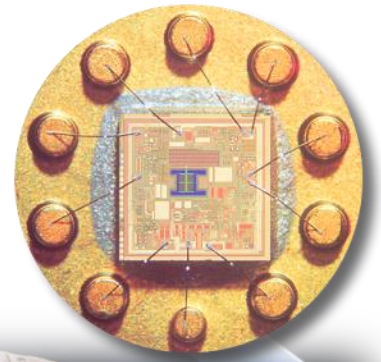
1st Monolithic Airbag Sensors



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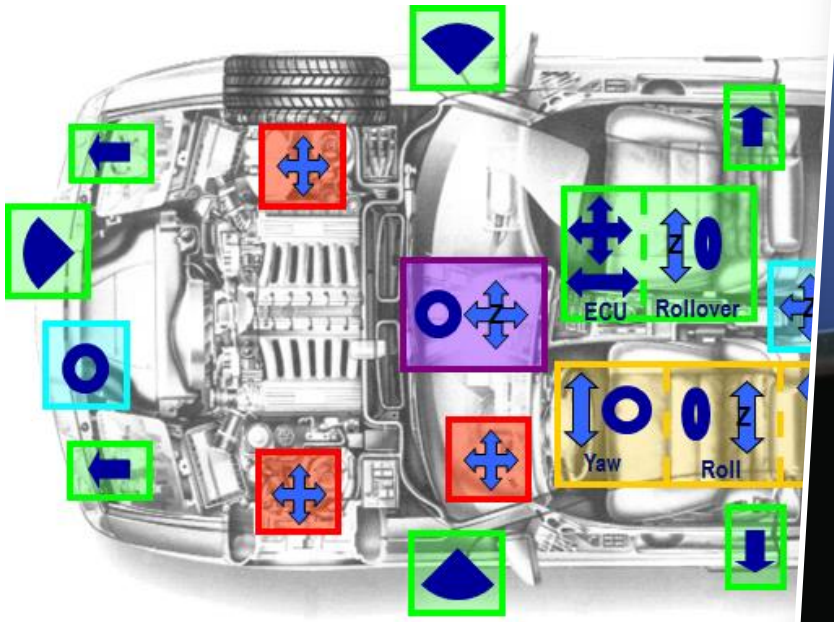
Today – Advanced Automotive Safety Systems Help Prevent Accidents



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Displacing Legacy Sensors

ADI MEMS Gyro

Volume = 665 mm³

1/400th the Size

Ring Laser Gyro

Volume = 274,000 mm³

Specifications: ADIS16266 MEMS Gyro

Specifications: Honeywell Aerospace GG1320AN Digital Laser Gyro

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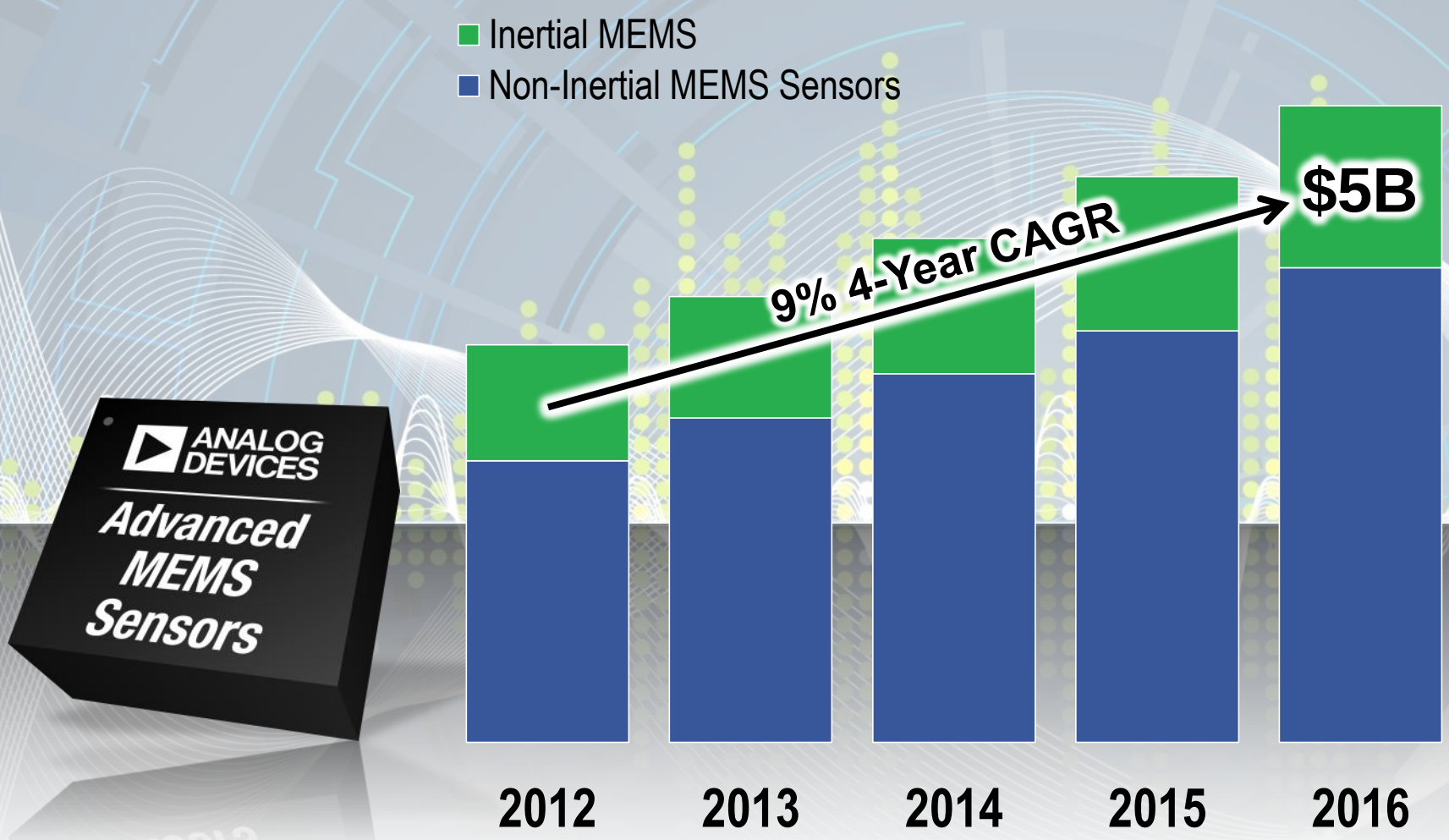
$5B Worldwide Inertial MEMS Opportunity



Source: Yole

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Application: Platform Stabilization

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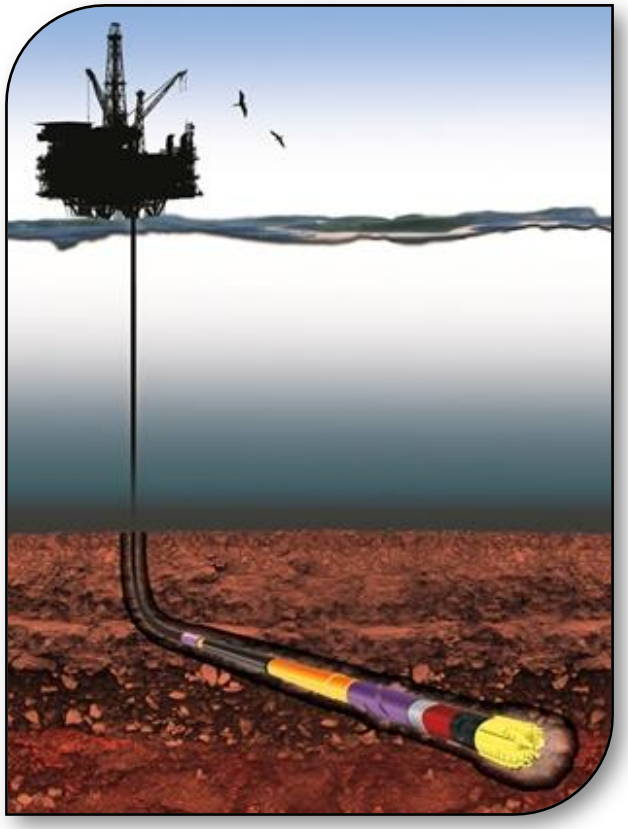
Application: Very Accurate Pointing



Application: Precise Placement or Positioning

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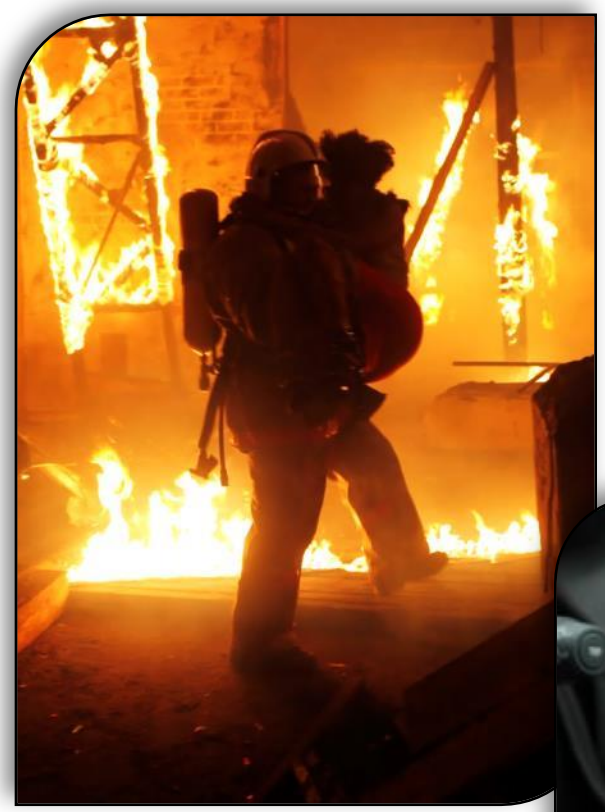
Application: Navigation, Globally or Locally



Application: Detection of Crash, Shock, or Fall

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Replacing Mechanical Sensors and Enabling New Applications

ADI MEMS Gyro

ANALOG DEVICES

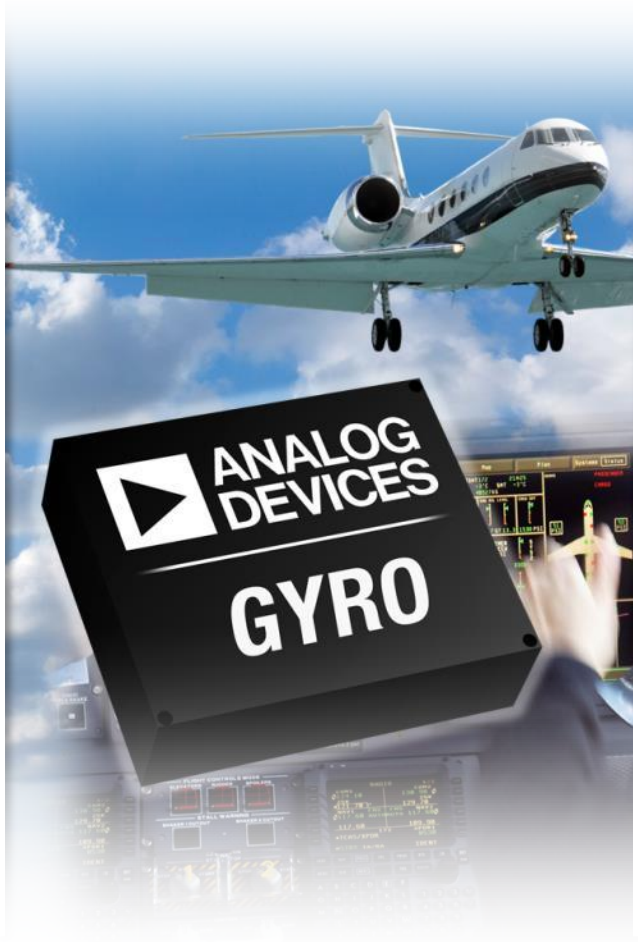
ADI MEMS Portfolio

ANALOG DEVICES

Key Product Categories of ADI MEMS Inertial Sensors

Accelerometers

Gyroscopes



Inertial Measurement Units (IMU)

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Accelerometers

INDYCAR

ANALOG DEVICES

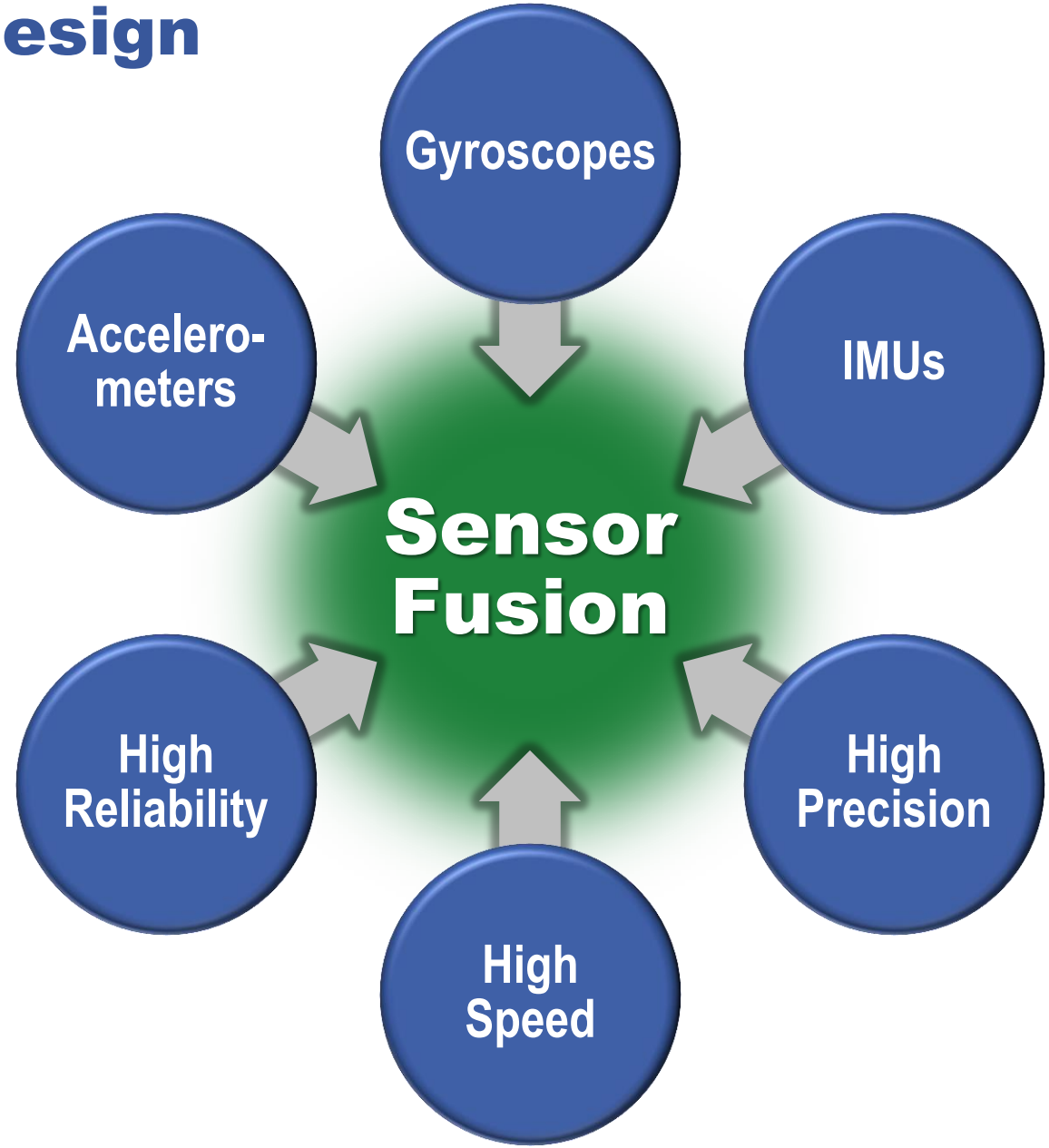
Accelerometers

ANALOG DEVICES

Gyroscopes


Fail-Safe iMEMS® Gyroscope
Automotive Qualified for Safety-Critical Applications
ANALOG DEVICES
ADXRS800
ON
ESC
OFF
ANALOG DEVICES
ADXRS800

Major Design Trend



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Inertial Measurement Units

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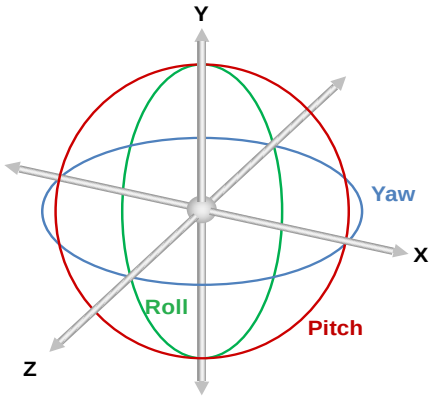
IMU with 10-Degrees of Freedom

[10]

Acceleration In…

[3]
- X
- Y
- Z



Rotation In…

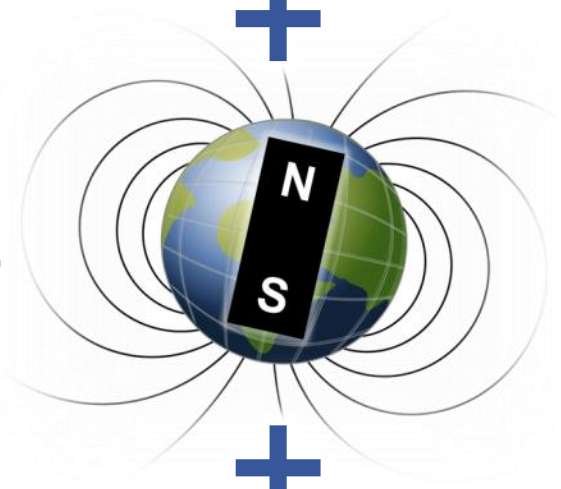
[3]
- Pitch
- Roll
- Yaw

+

=

Magnetic Orientation In…

[3]
- Pitch
- Roll
- Yaw

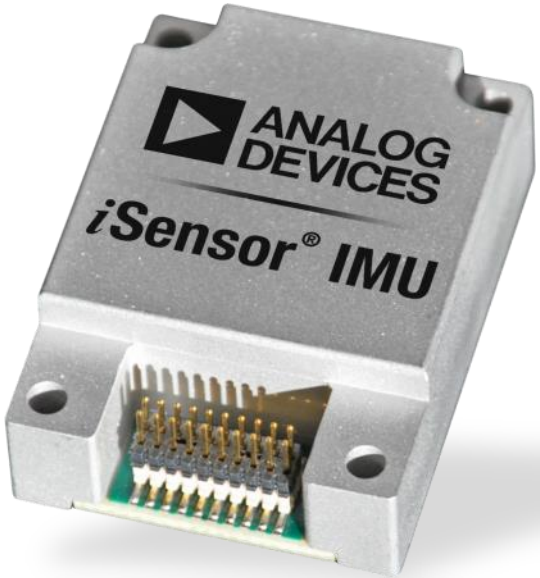


+

[1]
- Barometric Pressure (Altitude)

IMU Full Factory Calibration

Strong Competitive Differentiator



iSensor Factory Calibration Rig

Sensor Fusion In Automotive Safety

Predict

Prevent

Protect

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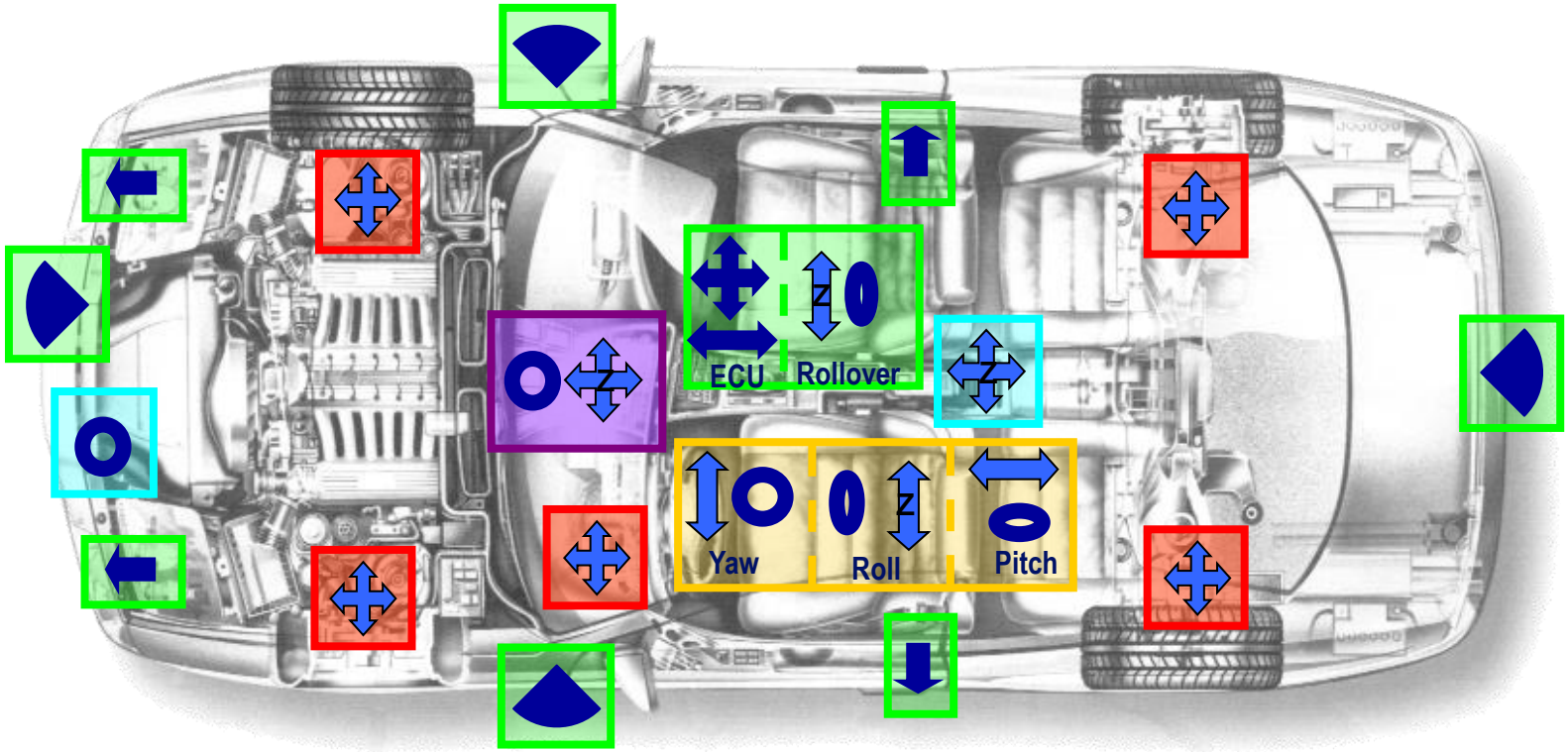
Strong ADI Fit with Automotive Applications



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

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

- Pitch Gyro
- Roll Gyro
- Yaw Gyro

- Airbag
- Seatbelt Pretensioner
- RADAR

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Sensors Make Perfect Sense for ADI

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Perfectly Aligned With Our Capabilities

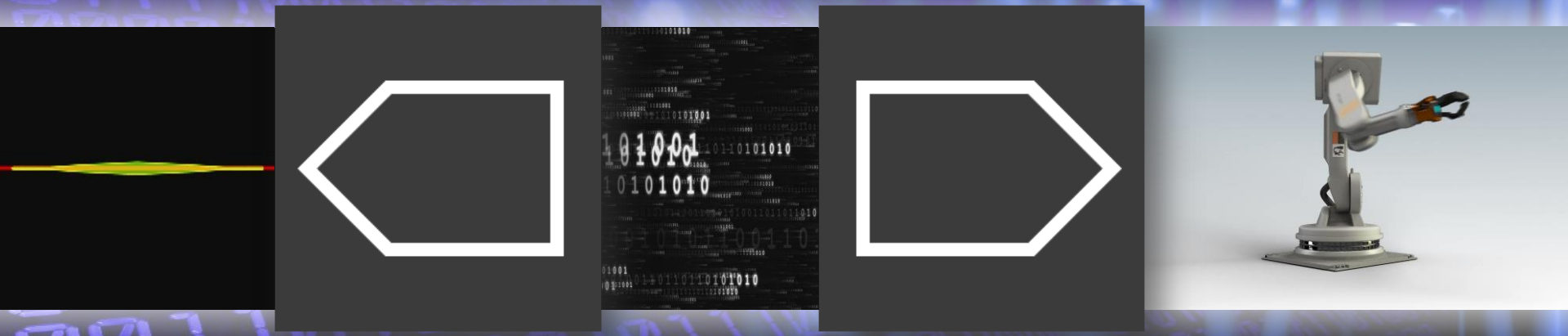
Sense, Capture, Condition

Convert

Process

Convert

Condition, Action, Experience



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ADI Has Profound Advantages

- ✓ Engineering the complete signal chain
- ✓ Extracting usable data through advanced signal processing
- ✓ Circuit design innovation
- ✓ Ultra-low power devices with battery lifespans of >10 years
- ✓ The industry's highest quality and reliability

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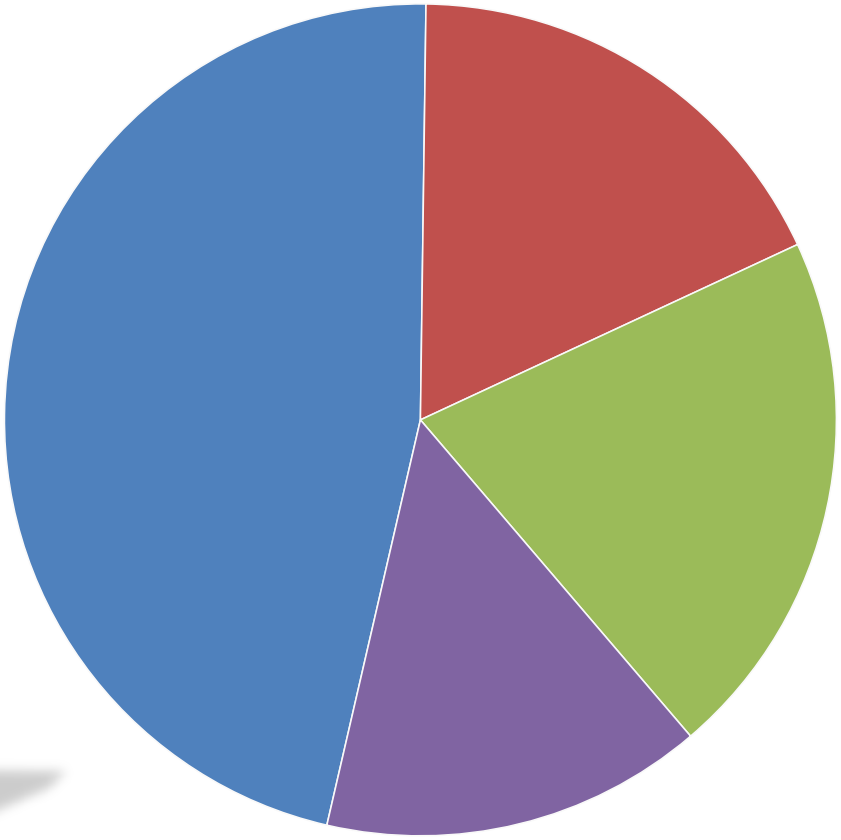
Inertial Sensors Perfectly Aligned With Our Strategic Markets

ADI 3Q FY2013
Revenue by End Market



Industrial 47%
- Instrumentation
- Automation
- Defense/Aero
- Energy
- Healthcare

Automotive 18%
- Safety
- Powertrain
- Infotainment

Communications 21%
- Wireless Basestations
- Wired Infrastructure

Consumer 15%
- Imaging
- Smartphones and Tablets
- Home/Pro AV

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Unit Growth and Content Gains Fuel MEMS Sensor Growth

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Perfectly Aligned With Our Franchise

Global Leader
in signal processing

Dedicated to
Breakthrough Innovations
to provide a competitive edge

High-Value Solutions Partner
for today's complex ecosystems

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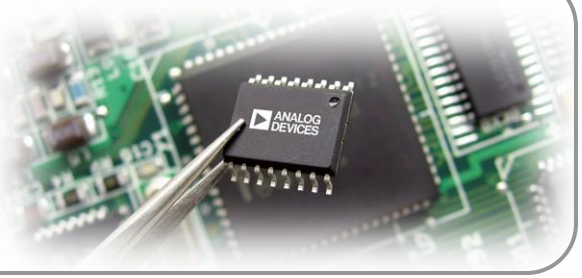
How ADI Is Winning In Sensors

Automotive, Industrial, and Healthcare driving growth

New and displacement opportunities create halo effect for both MEMS and signal path content

MEMS: High barriers to entry and long product lifecycles – part of ADI's DNA



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Submit your questions online via the webcast interface

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