

SIXTEENTH ANNUAL

BiTSTM

Burn-in & Test Strategies Workshop

March 15 - 18, 2015

Hilton Phoenix / Mesa Hotel
Mesa, Arizona



Archive – Keynote Address

Keynote
Address

BiTS Workshop 2015 Schedule

Frontiers Day

Monday March 16 9:00 am

[Making Sense of the Internet of Tomorrow](#)

Joe Bruen

*Director, Product Improvement and Operations, Sensor Solutions
Division*

Sensor Solutions Division
Freescale Semiconductor

Keynote Address – Abstract & Biography



Dr. Taheri will share his thoughts on microelectromechanical systems (MEMS) sensing technology and the end applications which include automobiles to smartphones and everything in between. He will explore the Internet of Things (IoT) which will connect all these devices and will become the Internet of Tomorrow.

Dr. Babak Taheri joined Freescale as the vice president and general manager of the Sensor Solutions Division in May 2013. Prior to Freescale, Dr. Taheri was the vice president of non-volatile products (NVP) at Cypress Semiconductor where he acquired Ramtorn. His Cypress Business Unit was number one for gross margin. Dr. Taheri has held other positions at Cypress including Vice President of corporate Intellectual Property (IP), whose team headed up development of Cypress's first multi-touch sensing technology. He also established over 12 centers of excellence worldwide managing design IP for the corporation. Prior to re-joining Cypress, Dr. Taheri was vice president of engineering at InvenSense Inc., a fabless MEMS semiconductor company focusing on high-volume product delivery to consumer markets.

Dr. Taheri has more than 28 years of semiconductor industry experience including founding Integrated Biosensing Technologies, a sensor biomedical corporation. He also has held key positions at Intel, SRI International, Redwood Microsystems, and Apple. He holds a doctorate degree in Electrical Engineering & Neurosciences from the University of California at Davis. Dr. Taheri has more than 21 issued United States patents.

Making Sense of the Internet of Tomorrow

**Dr. Babak Taheri | Vice President and GM
Freescale Sensors**




**2015 BiTS Workshop
March 15 - 18, 2015**



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Quick Intro



- **Freescale Semiconductor**
 - VP/GM Sensor Solutions Division
 - **2014 Executive of the Year** 
- **Cypress Semiconductor**
 - VP/GM ranked #1 for BU gross margin
- **InvenSense**
 - VP Engineering achieved high-volume production for consumer markets
- **Integrated Biosensing Technologies**
 - Founder / CEO
- **PhD in EE and Neurosciences, UC Davis**
- **Holds 20+ patents**



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Presenter Quick Intro – Joe Bruen



- **Freescale Semiconductor**
 - 27 years of various responsibilities
 - Manufacturing
 - Planning
 - Finance
 - Operations
 - Currently: Director, Product Improvement and Operations, Sensor Solutions Division
- **Previous Responsibilities**
 - Chief of Staff Analog Sensors Group
 - Factory Transfer Manager (Analog/Sensors)
 - Foundry Business Operations (Qualcomm)
- **Graduate in Business (Glasgow Caledonian University)**



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SECURE EMBEDDED PROCESSING SOLUTIONS for the **INTERNET** *of* **TOMORROW**



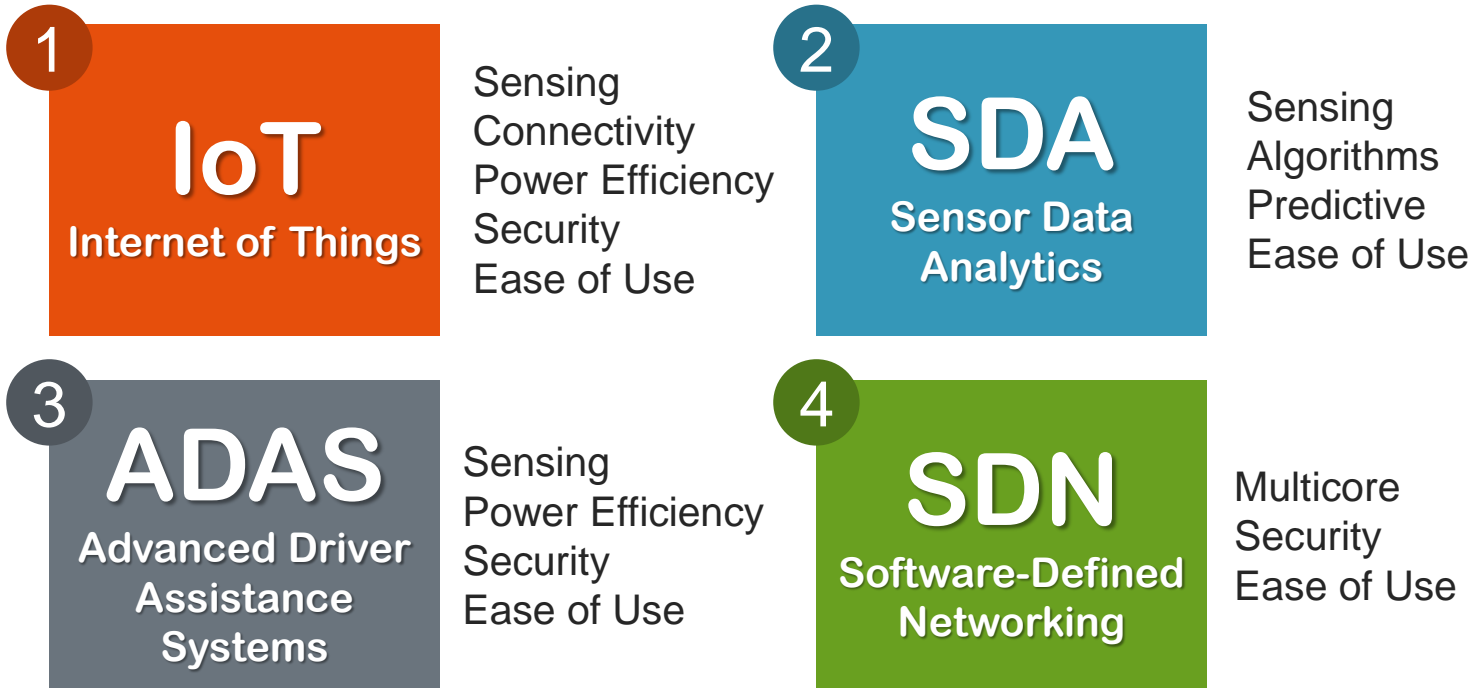
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Mega Trends

INTERNET *of* TOMORROW

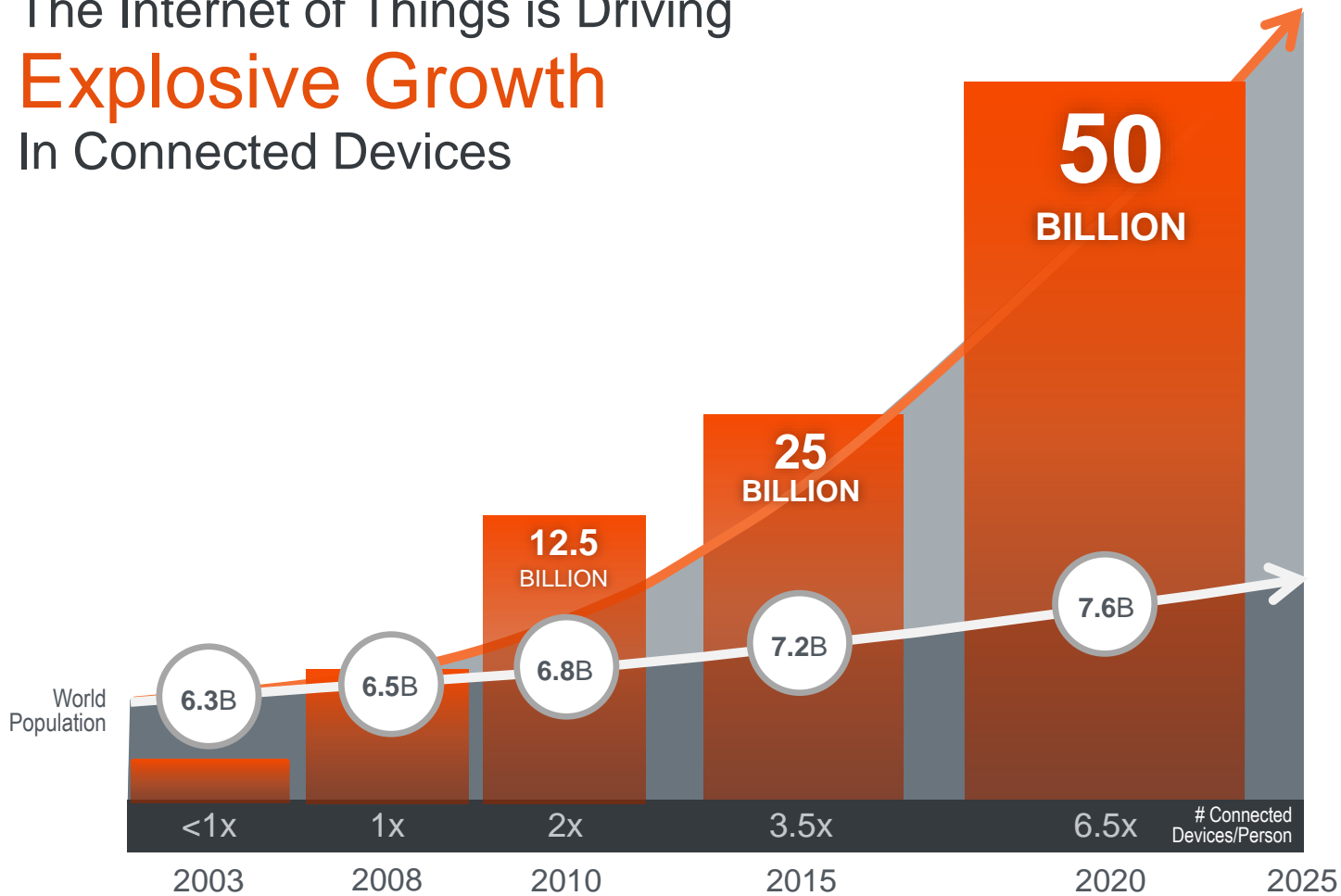


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The Internet of Things is Driving
Explosive Growth
 In Connected Devices



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* Sources: Ericsson, February 2011; Cisco Internet Business Solutions Group (IBSG), April 2011



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Wearables

Critical trends

- Miniaturization for ease of use
- Low power for extended battery life
- Connectivity to the cloud and smart phones
- Multi-functional products with growing sensing and processing of data
- Scalable solution for quickly evolving market

Moving beyond sensing to data analytics:

- Sensors are *the* source of big data
- New economies developing for monetizing sensor data analytics
- Robust sensors needed for big data
- Rich ecosystem with WaRP reference design

INTERNET of TOMORROW



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INTERNET *of* TOMORROW

Self-Driving:

Automotive Sensing
Car Centric thinking

Comfort and Infotainment

POD pressure Inertial
Altimeter

Remote Sensing

Radar
Proximity
LIDAR

Safety Safe Driving

Engine Control
Suspension
Airbags
TPMS



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Automotive Sensing

As Part of IoT Ecosystem | **200** More Sensors per Car

INTERNET of TOMORROW



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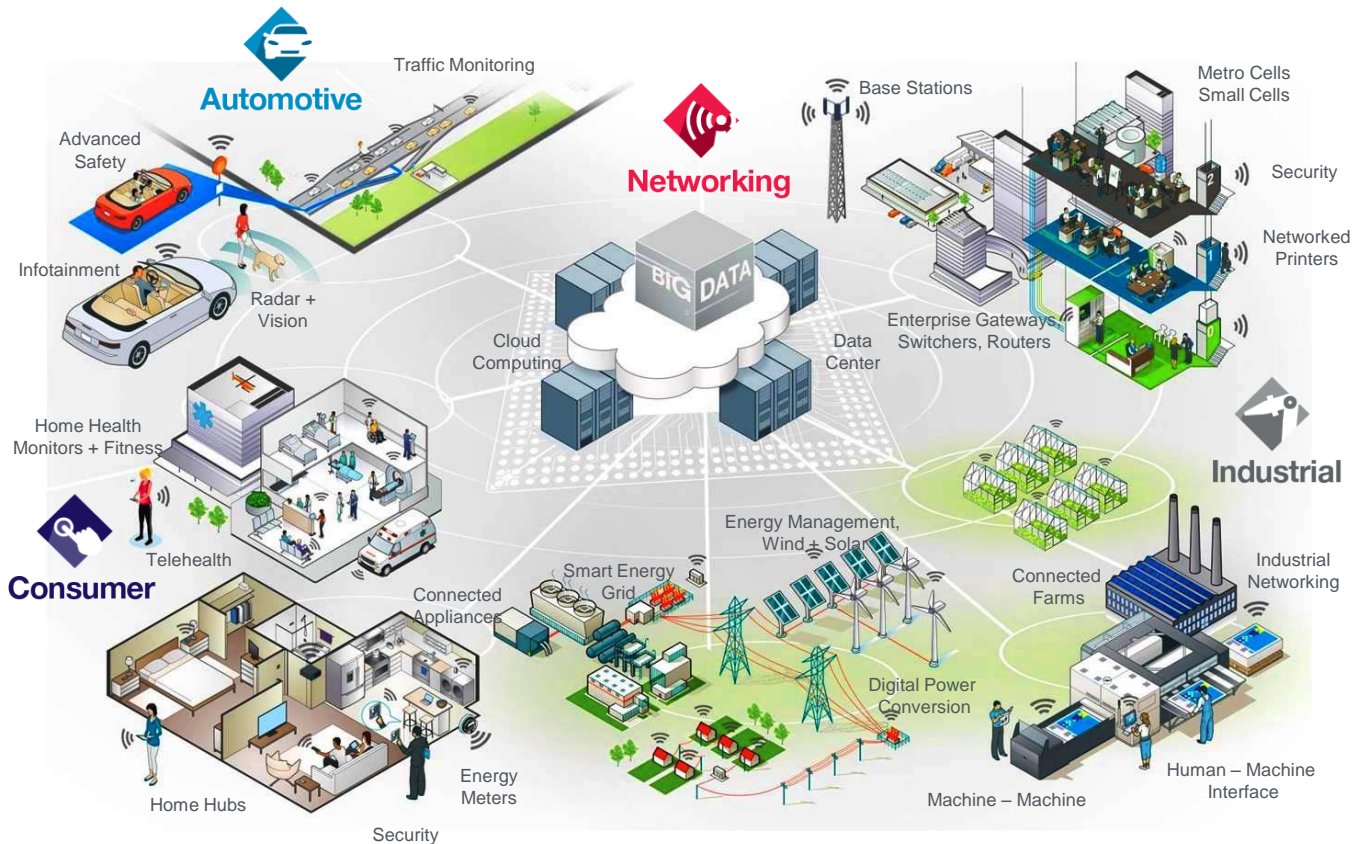


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Our Products

Microcontrollers | Digital Networking | Auto MCU | Analog and Sensors | RF

INTERNET of TOMORROW



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Burn-in & Test Strategy Trends

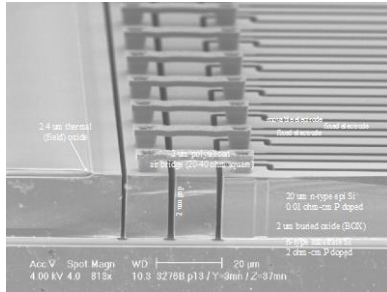


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Mega Trends in Burn-in/Test



ASIC Design

- Mixed Signal
- High voltage
- Expanding functionality
- Favor digital domain
- Scalability

Transducer Design

- Surface MEMS
- Bulk MEMS
- Epi-SOI
- High Aspect Ratio
- m-cavity

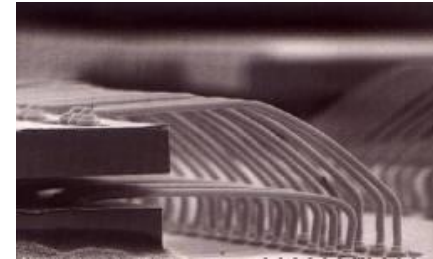
Connectivity

- Wireline—Wireless

Packaging

- Multi Chip Packaging
- Environment Protection
- Standard assembly & outlines
- Stress optimized package
- Stacked die flip-chip
- Pb-free processing

Technology-Driven
Integration
Application-Specific
Flexibility
Design for Reliability
Design for Testability
CMOS-Compatible
Manufacturing



Testing

- Standard handlers and testers
- Multi-axis flexibility
- Shaker-less trimming
- UP Scan digital domain



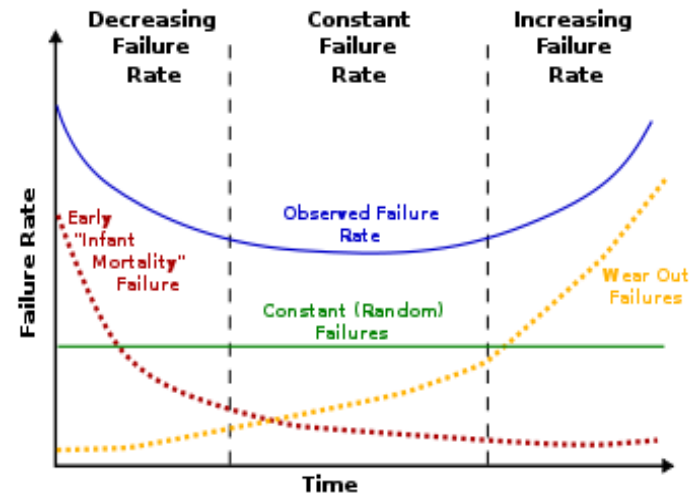
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Achieve Zero Burn-in

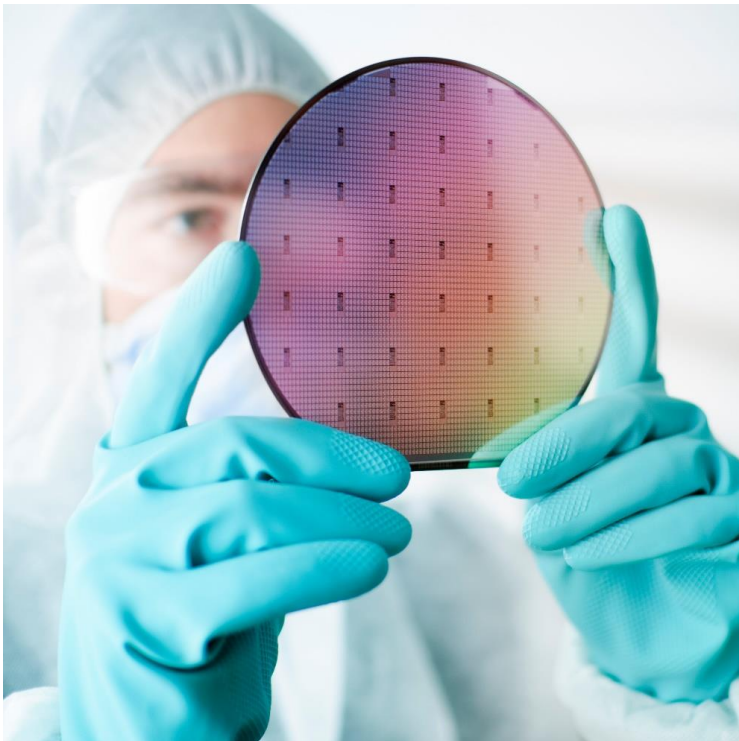
- CMOS zero burn-in for 90nm and older technologies
 - Worse case – Use a Sample based BI
- Transducers zero burn-in for any geometry



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Wafer Level Chip Scale -WLCSP Packaging/ Testing



- CMOS currently no issues
 - Can test wafer with < 12 pins
- MEMS currently non-existent
 - Can test wafer with < 12 pins
- Future MEMS will be WLCSP
 - 8" and 12" wafer
 - Can Shake/Flip at wafer level



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Summary

- Freescale sensor growth – continuing strong momentum into 2015
- Freescale sensors are essential for data processing for the Internet of Things
- Sensor data analytics enables broader proliferation to more than 200 unique applications a year
- Product longevity, device characterization and ultra reliability for embedded IoT solutions
- As functionality of electronic components increases, we need your help/expertise to achieve zero burn-in



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