SOTB™ UPDATES & SENSOR INTRODUCTION

RENESAS ELECTRONICS AMERICA, INC.

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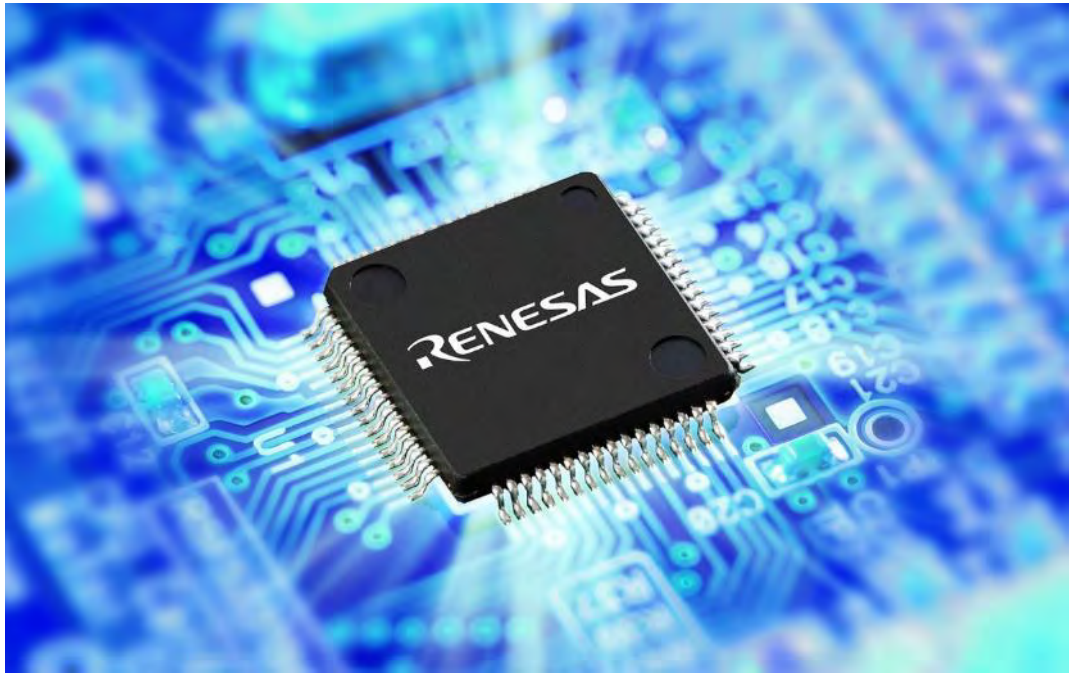
WHO WE ARE

THE WORLD'S LEADING EMBEDDED SOLUTION PROVIDER

Renesas is a global semiconductor company built on a strong historical foundation of technological innovation. We deliver trusted embedded design innovation with complete semiconductor solutions that enable billions of connected, intelligent devices to enhance the way people work and live.

- Leads globally in microcontrollers, analog, power, SoC products
- Focuses on a broad range of Automotive, Industrial, Home Electronics, Office Automation, and Information Communication Technology applications
- 757.4 billion yen in net sales in 2018
- Has 20,000+ employees worldwide *1
- Headquartered in Tokyo, Japan



*1: Consolidated, as of April 1, 2019 / SoC: System-on-a-chip

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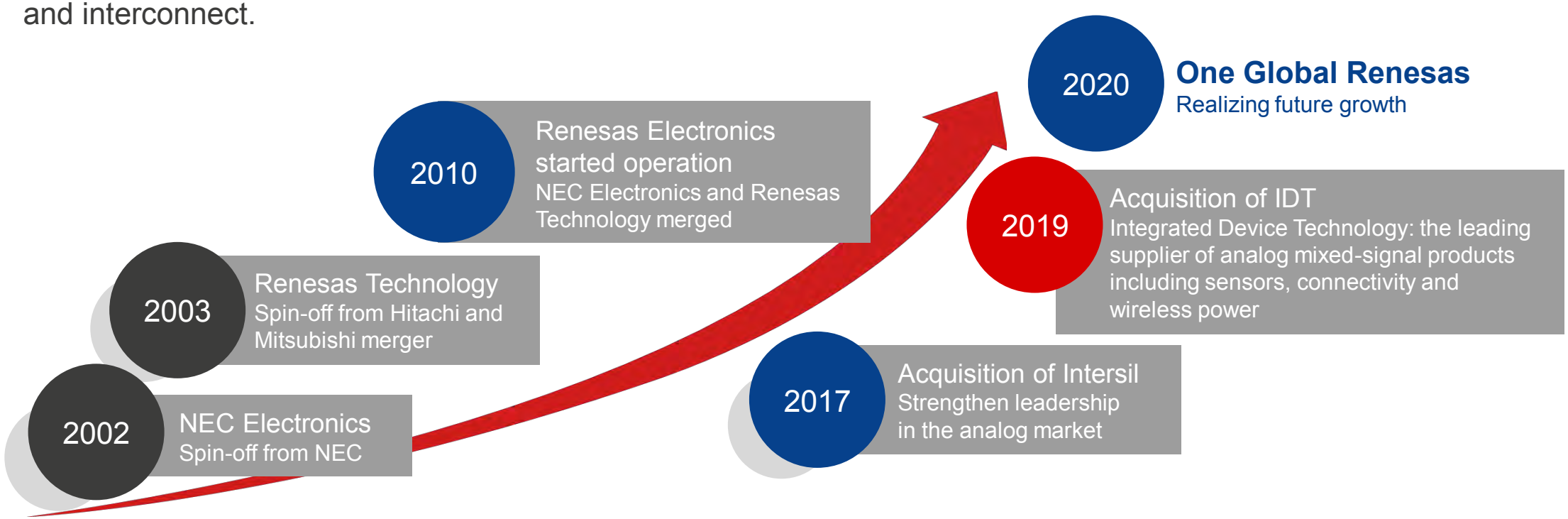
OUR HISTORY

Renesas is built on a strong historical foundation of technological innovation originating from Hitachi, Mitsubishi, NEC, and Intersil. In 2019, Renesas plans to address the fast-growing data economy and connected world together with IDT's analog mixed-signal products for data sensing, storage and interconnect.



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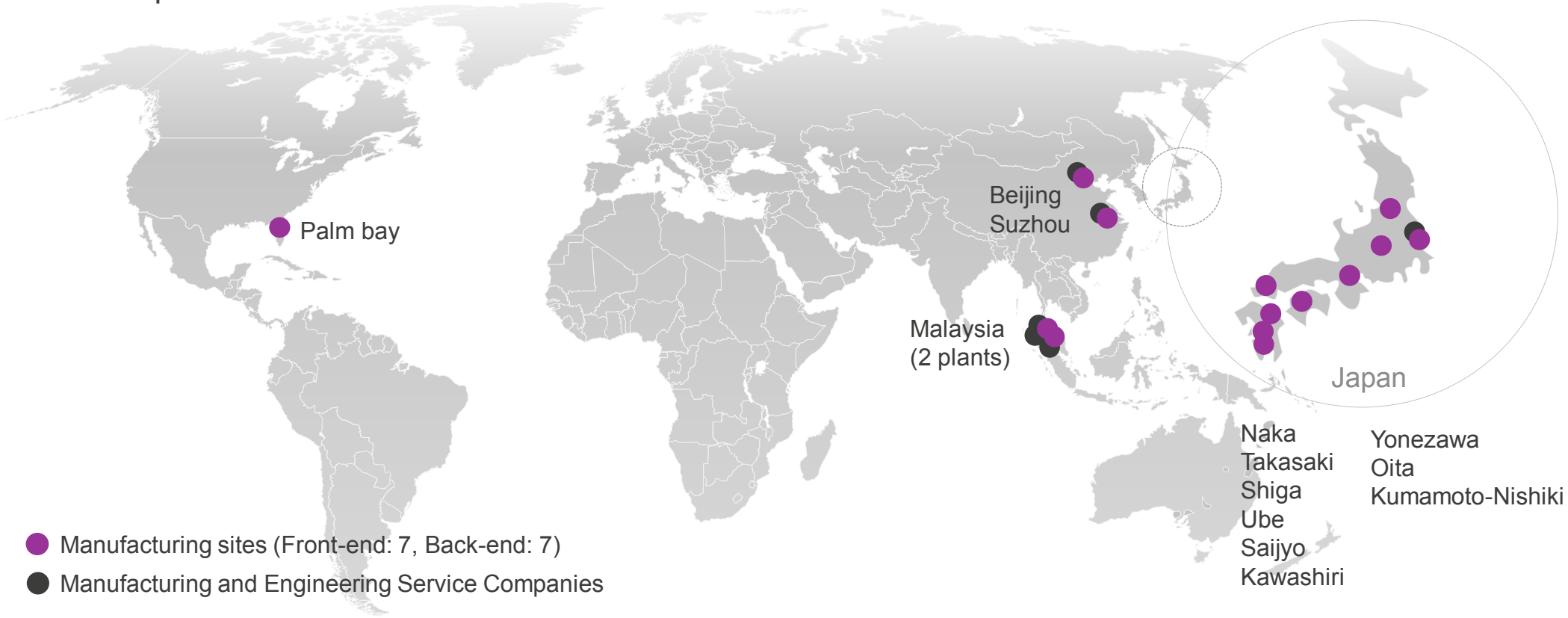
BIG IDEAS FOR EVERY SPACE RENESAS

GLOBAL MANUFACTURING NETWORK

AS OF JANUARY 1, 2019

- 14 manufacturing facilities owned in Japan, China, Southeast Asia, and the US
- Global partner's sites such as TSMC and GLOBALFOUNDRIES



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BIG IDEAS FOR EVERY SPACE RENESAS

BROAD PRODUCT PORTFOLIO

Microcontrollers and Microprocessors

- RENESAS RL78 — 8/16-bit Ultra-low energy Sensing and Motor Control
- RENESAS RX — 32-bit High power efficiency Motor Control
- RENESAS RZ — 32-bit Arm-Based High-End HMI Network
- RENESAS RH850 — Renesas 40nm process Automotive

…and more

Analog & Mixed Signal, Power Discrete

- Analog Devices
- Interface
- Memory
- Optoelectronics
- Power Management
- Sensors
- Space & Harsh Environment
- Timing & Digital Logic

For automotive:

- Power Management
- Battery Management
- Video & Display

…and more

SoC, Integrated Platforms

- RENESAS R-Car — Automotive
- RENESAS R-IN — Factory automation

Renesas autonomy™	Automotive
Renesas Synergy™	IoT and IIoT
Renesas RZ/G Linux	Industrial, HMI

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AUTOMOTIVE

ELECTRIC VEHICLES / CONNECTED CARS / AUTONOMOUS DRIVING

Open, innovative and trusted: Embedded intelligence for the future of driving.

- **Leading MCU/SoC supplier**
  W/W shipments reached approx.1.3B units in 2017
- **Best in quality**
  Extremely low failure rate at 0.1ppm
- **Advanced process**
  16/14nm FinFET for SoC, 40nm to 28nm cutting edge process for MCU

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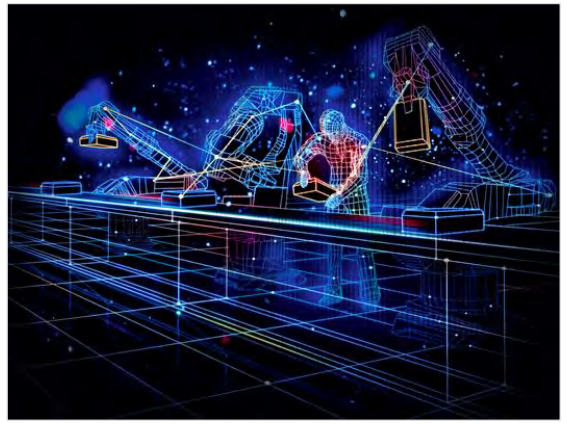
INDUSTRIAL AND BROAD-BASED
SMART FACTORY / SMART LIVING / SMART INFRASTRUCTURE

Switching on connections for greater human productivity, between people and homes, and between humans and our environment.

- **Real-time**
  embedded-Artificial Intelligence (e-AI)
- **Energy-saving breakthrough**
  Silicon on Thin Buried Oxide (SOTB™)
- **Innovation & differentiation**
  Comprehensive and integrated platforms



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SOTB INTRODUCTION

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SOTB™– SILICON ON THIN BURIED OXIDE DISRUPTIVE EXTREME LOW-POWER TECHNOLOGY

- Exclusively from Renesas
- SOTB breaks previous trade-off between getting either low active current or low standby current
- You Get Both

No Compromises

		Max. Frequency		Active Current		Standby Current	
		Higher	Lower	High	Low	High	Low
Conventional Technology	Larger Geometry		■	■			■
	Smaller Geometry	■			■	■	
	SOTB Technology	■			■		■

SOTB is the Recipe for Very Capable Extreme Low-Power Applications that Can Run from Harvested Energy

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BIG IDEAS FOR EVERY SPACE RENESAS

CONNECTED LOW-POWER APPLICATIONS
SOTB-BASED ELECTRONICS EXPANDS APPLICATIONS

- Battery-free or longer battery life, lower or no maintenance, remote deployment, more customer satisfaction

Process Control

Building Automation

Medical

Wearables

Home Automation

Consumer Products

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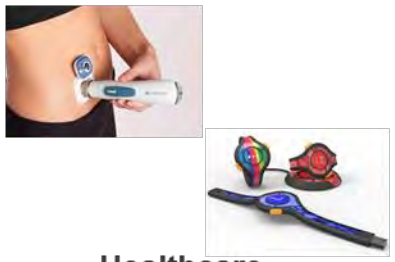
BIG IDEAS FOR EVERY SPACE RENESAS

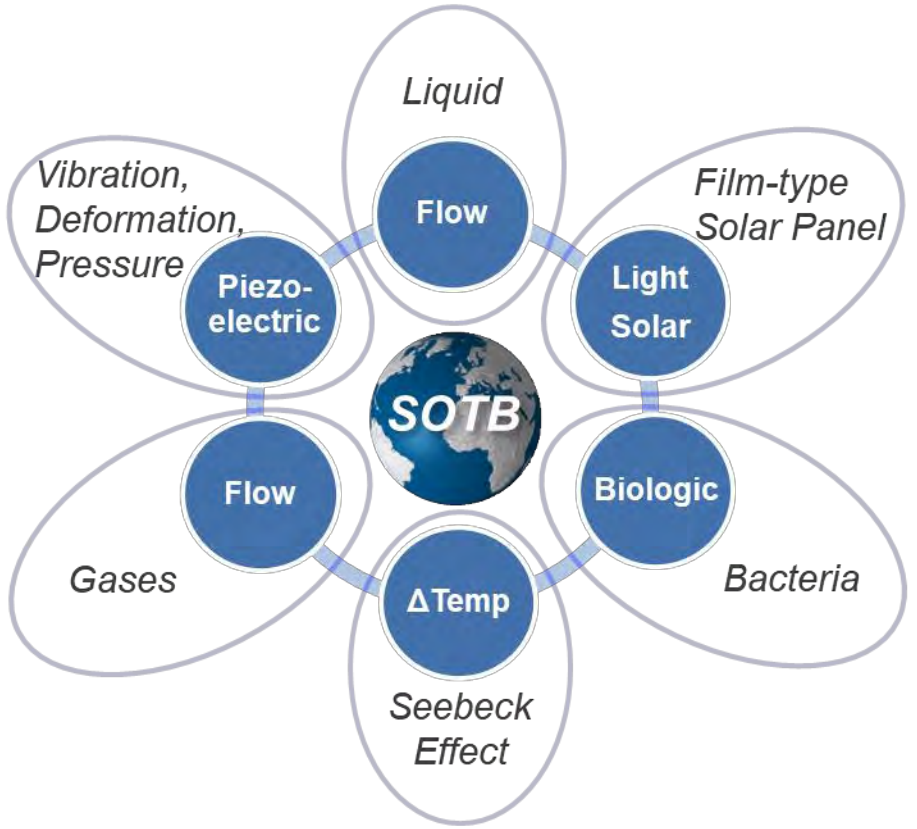
ENERGY HARVESTING BECOMES REALITY
SOTB CONTROLLERS SIMPLIFY AND MANAGE HARVESTED ENERGY SOURCES

- Renesas SOTB-based controllers connect directly to EH sources – removes design complications



Healthcare and Fitness

Home Security and Appliances



Infrastructure Services (Cyber Physical Systems)

Energy Harvesting Wearables

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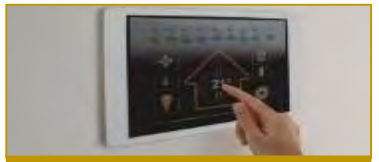
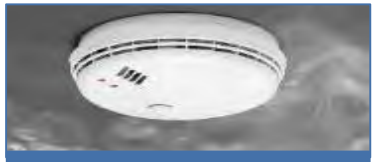
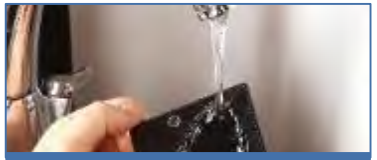
BIG IDEAS FOR EVERY SPACE RENESAS

APPLICATION USE CASES ARE EXPANDING
EXTREME LOW POWER – MARKET GROWTH POTENTIAL

Medical / Healthcare	City / Infrastructure		Industrial / Automation	Energy Management	Gadget / Home Devices / …
 Fitness Wearable	 Smart Agriculture	 Urban Environment	 Equipment Monitor	 Controller	 Gadget
 Portable Device	 Public Facility	 Home/Office Security	 Worker Monitor	 Lighting	 Home Device
 Capsule Device	 Transportation	 Natural Environment	 Smart Tags	 Meter	 Sports & Outdoor
 Smart Watch	 Aquatic Product	 Monitoring			

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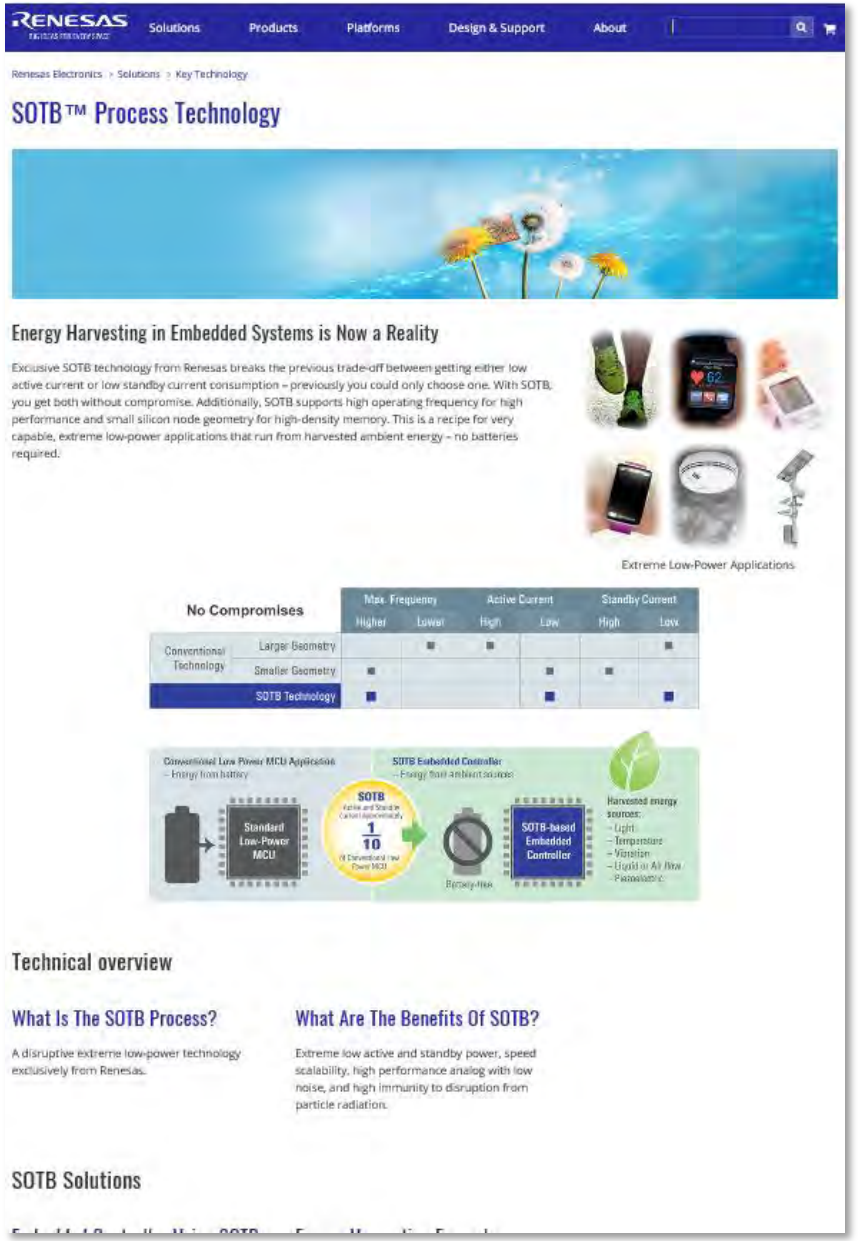
BIG IDEAS FOR EVERY SPACE RENESAS

SOTB PRODUCT WEB SITE LAUNCHED

SOTB Web site: https://www.renesas.com/us/en/solutions/key-technology/sotb.html

SOTB Chip Schedule:

- WS3 : Available Now
- CS : July 2019
- MP : October 2019



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SOTB TECHNOLOGY

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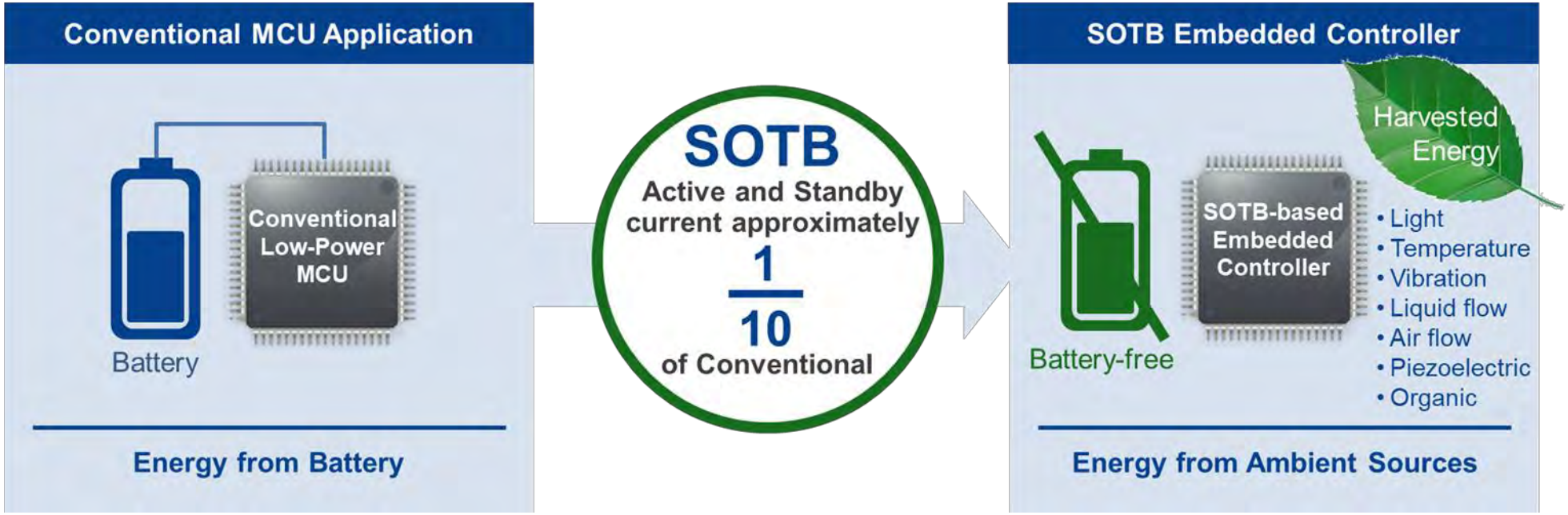
SOTB – FOR EXTREME LOW POWER

- Active Current: 20 uA per MHz of operation
- Standby Current: 150 nA
- SRAM data retention: Only 1nA per KB of SRAM



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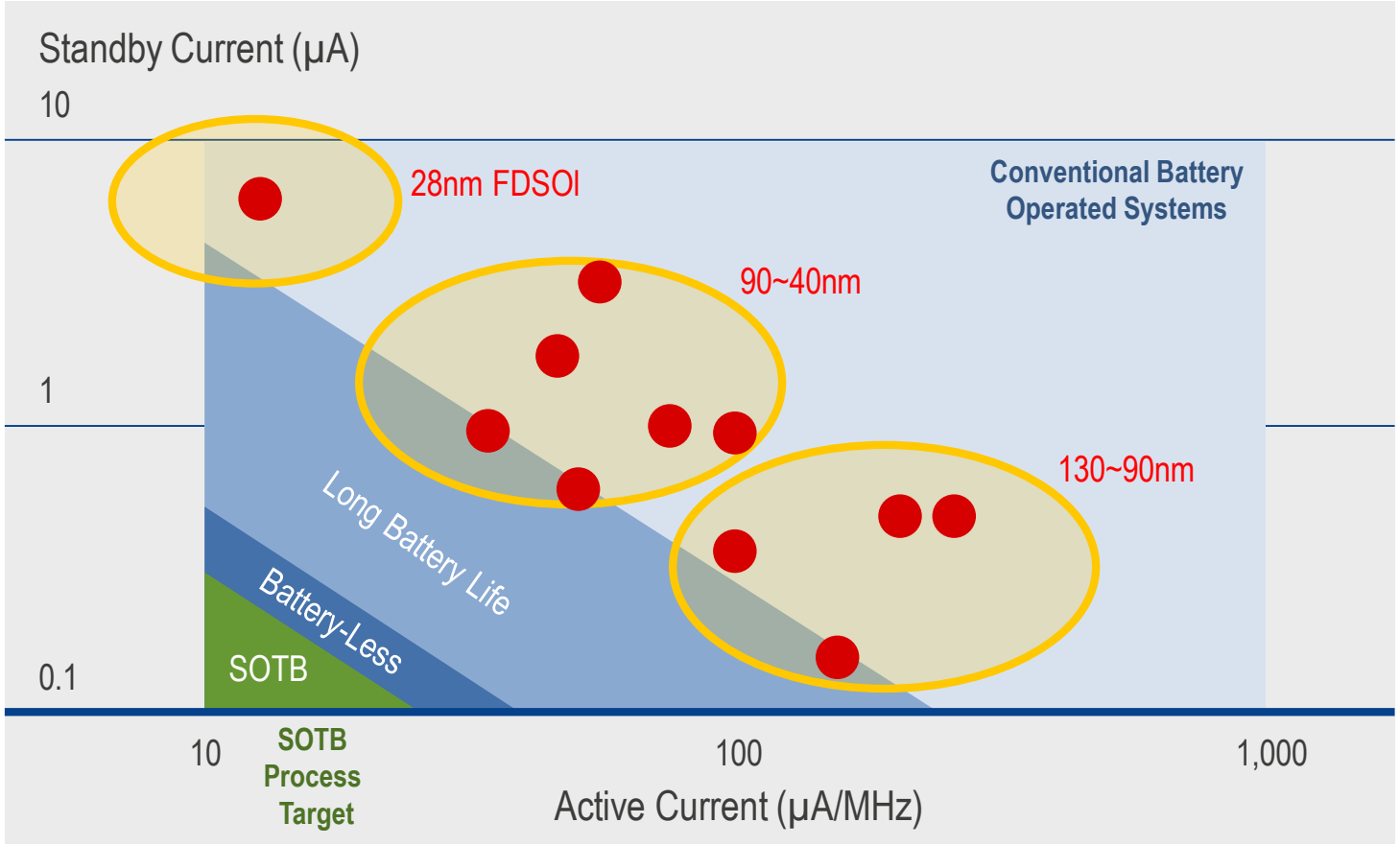
BIG IDEAS FOR EVERY SPACE RENESAS

EXTREME LOW POWER – BY SOTB TECHNOLOGY

SOTB ENABLES EXTREME LOW POWER MARKET



- SOTB achieves both:
  Low Active & Low Standby current
- Other technologies do not achieve both – only one or the other.

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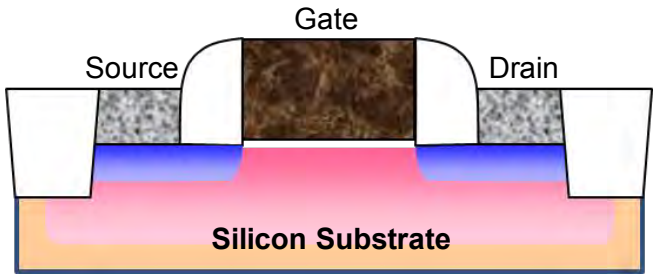
BIG IDEAS FOR EVERY SPACE RENESAS

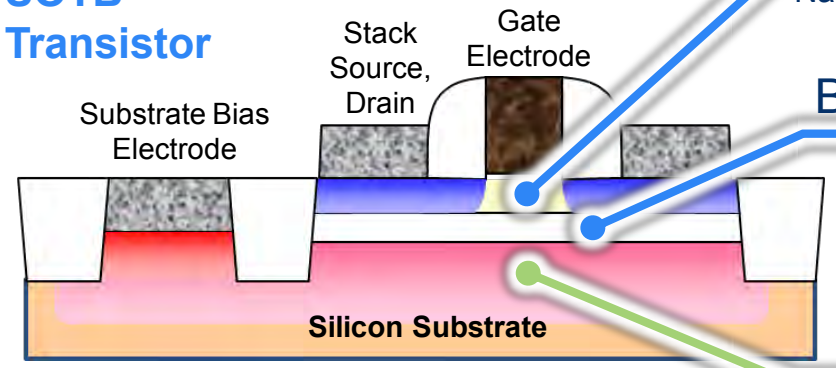
SOTB EXTREME LOW POWER

TRANSISTOR THRESHOLD VOLTAGE VARIANCE IS KEY

Bulk CMOS Transistor



SOTB Transistor



Dopantless Channel

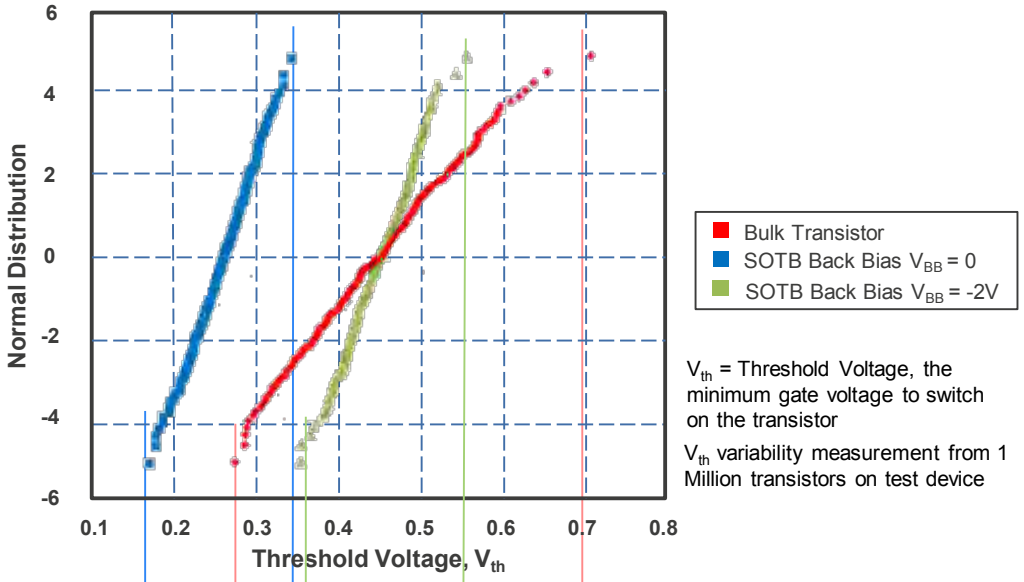
Narrow V_{th} variance, lower operation voltage, higher performance

Buried Oxide Layer

Leakage current minimized, lower parasitic capacitance

Back-Side Gate

Application of substrate bias voltage to minimize leakage



V_{th} = Threshold Voltage, the minimum gate voltage to switch on the transistor

V_{th} variability measurement from 1 Million transistors on test device

Wide V_{th} variance means higher operation voltage, higher power consumption

Narrow V_{th} variance means lower operation voltage, lower power consumption, better quality control

Applying -2.0 V bias to substrate shifts Vth higher to achieve lowest leakage current while supporting 64MHz operating frequency

No Compromise: Extreme-Low Active and Standby Current with High Performance

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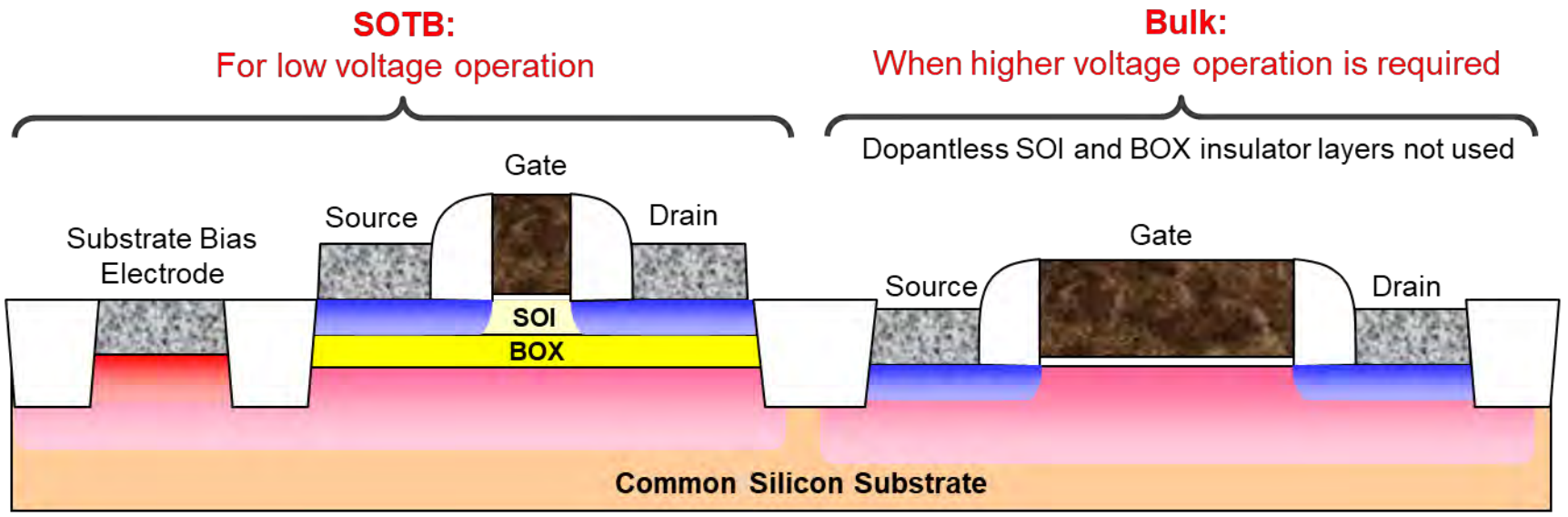
HYBRID SOTB AND BULK STRUCTURE

- Hybrid structure enables SOC designers to mix use of SOTB and standard CMOS bulk transistors as needed to optimize performance, efficiency, and adapt to existing IP designs



SOI = Silicon On Insulator
BOX = Buried Oxide

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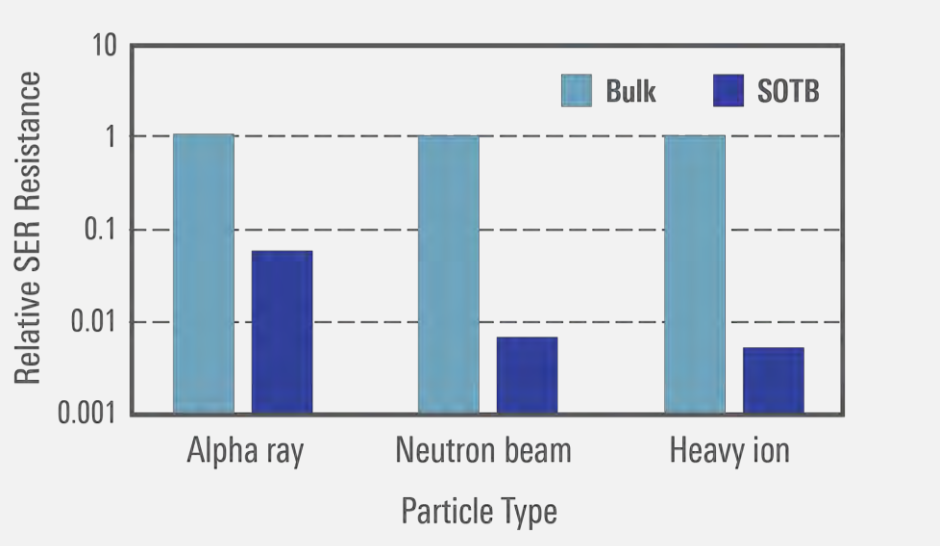
MORE SOTB BENEFITS

Soft Error Rate (SER) approaches ZERO

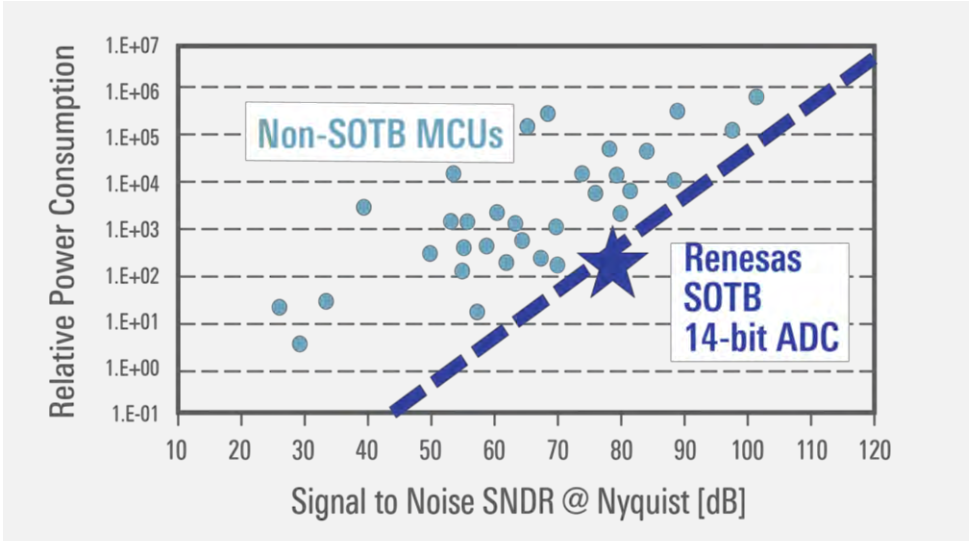
Immunity to code/data corruption by radiation



- SOTB's buried oxide (BOX) insulation layer reduces penetration of particle radiation. Result:
- Shown here are relative SER rates of SOTB and conventional bulk CMOS transistor structures.
- A soft error is an undesired inversion of logic level of data that is stored in memory or logic circuits. This type of error can corrupt data and/or cause erroneous execution of program code.

High-performance analog and low noise

More accuracy while consuming less power



- SOTB's dopantless SOI channel provides high performance analog with low noise, and more accuracy while consuming less power.
- Shown here are measures of analog accuracy, noise performance, power consumption of ADCs on MCU devices with and without SOTB. Both 12-bit and 14-bit ADCs are plotted.
- 14-bit Renesas ADC, based on SOTB, is most favorable in high accuracy, low noise, and low power consumption.

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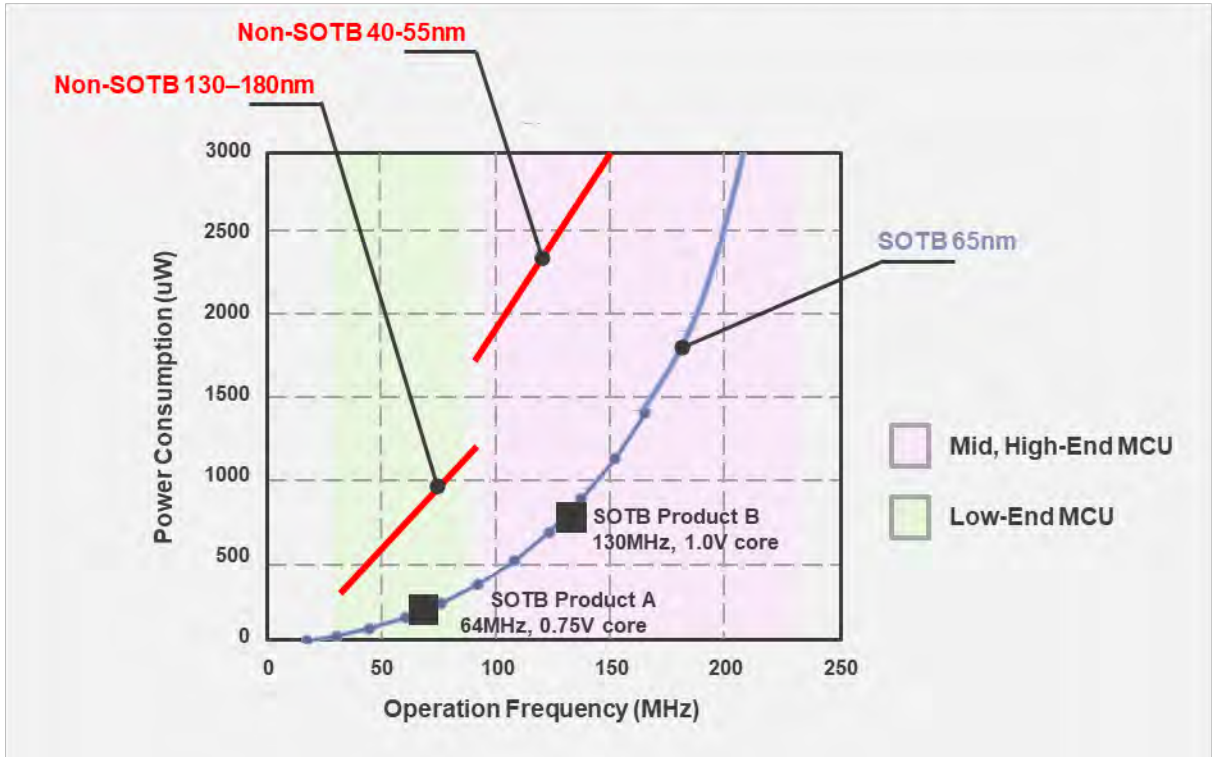
SOTB – A SCALABLE TECHNOLOGY

SOTB: One Process, One Geometry, for a Wide Product Range



- SOTB enables low, mid, high-end MCU devices to scale in performance while maintaining superior low power characteristics when compared to MCUs not using SOTB.

- Shown here, 65nm SOTB is extremely favorable in performance-per-power-consumption compared to non-SOTB processes ranging from 40nm to 180nm.

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BIG IDEAS FOR EVERY SPACE RENESAS

ENERGY HARVESTING

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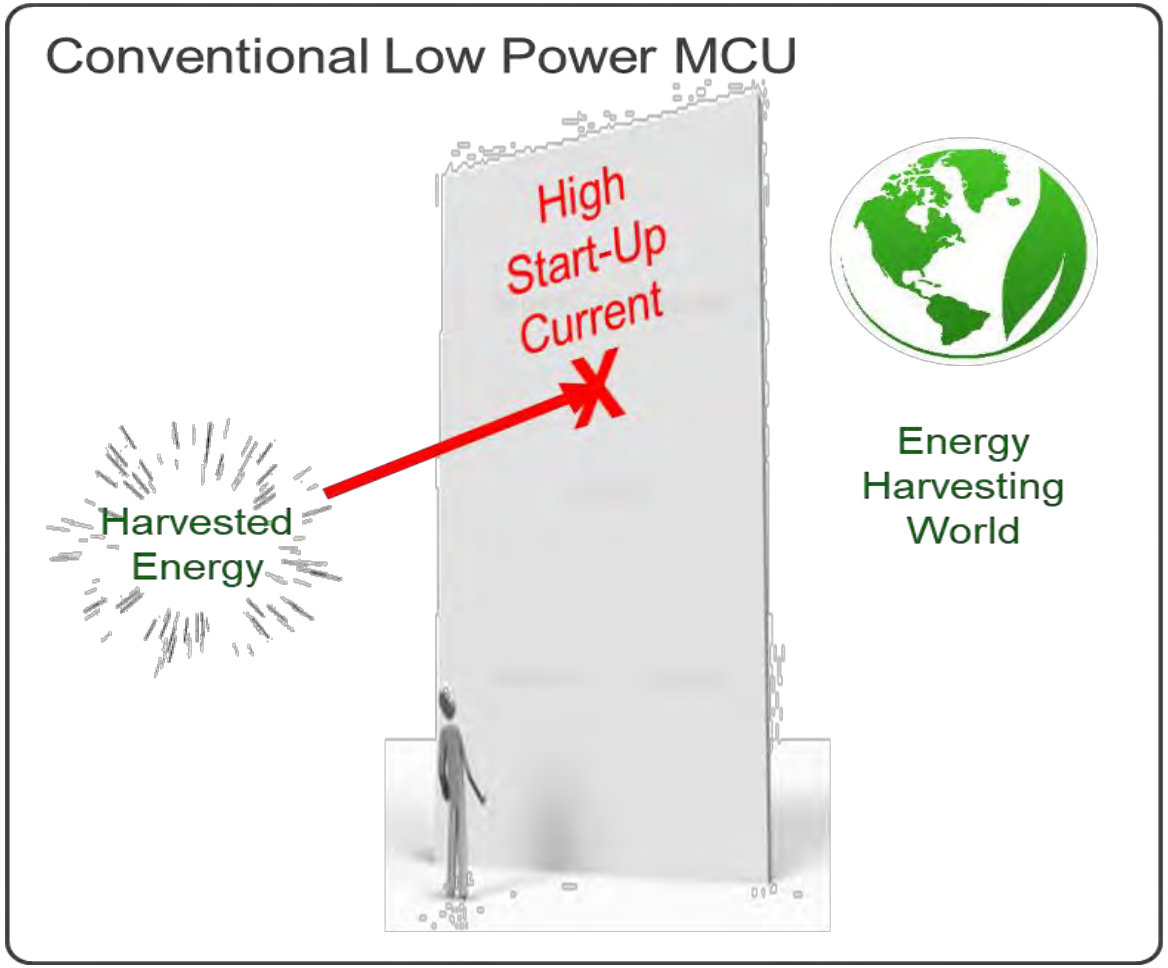
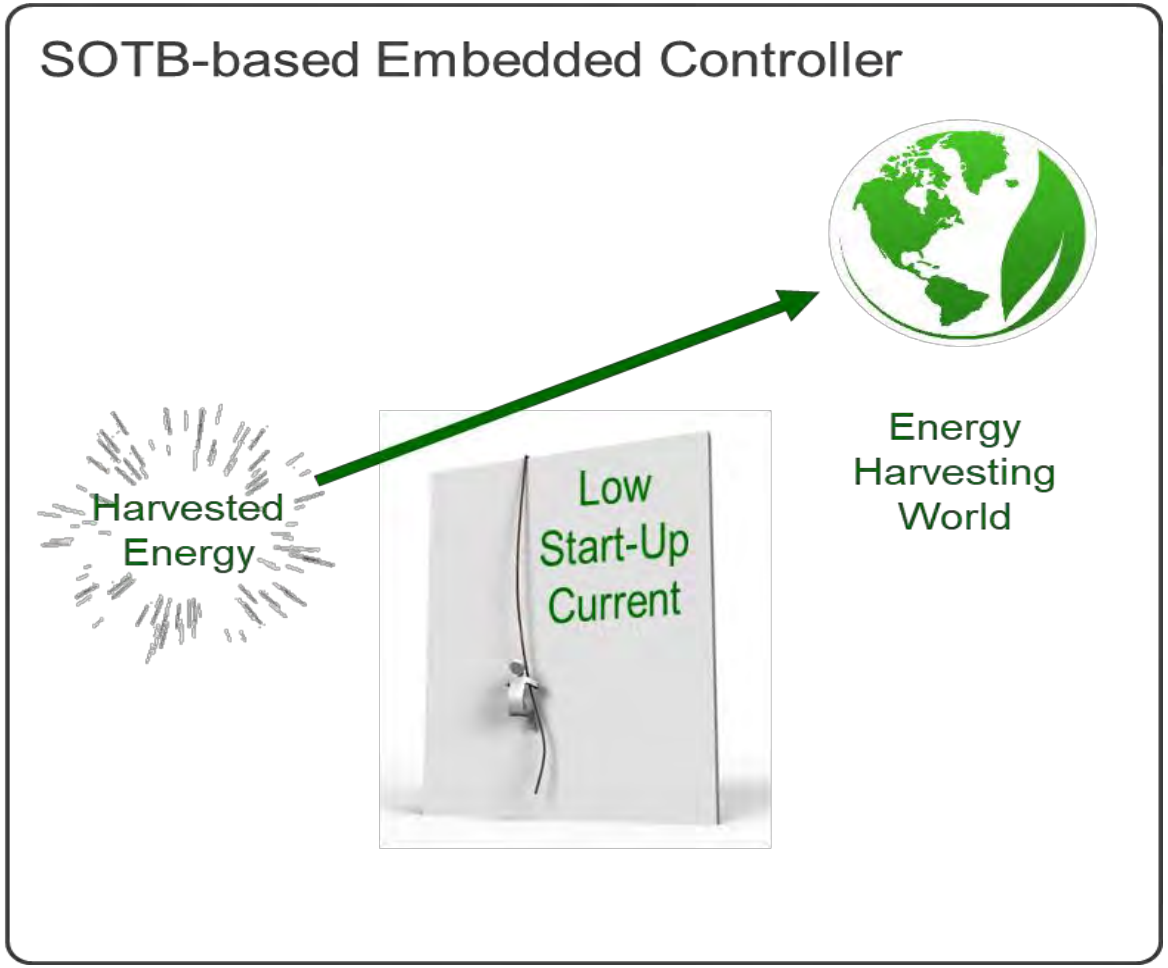
SOTB DEVICES EASILY START UP ON HARVESTED ENERGY





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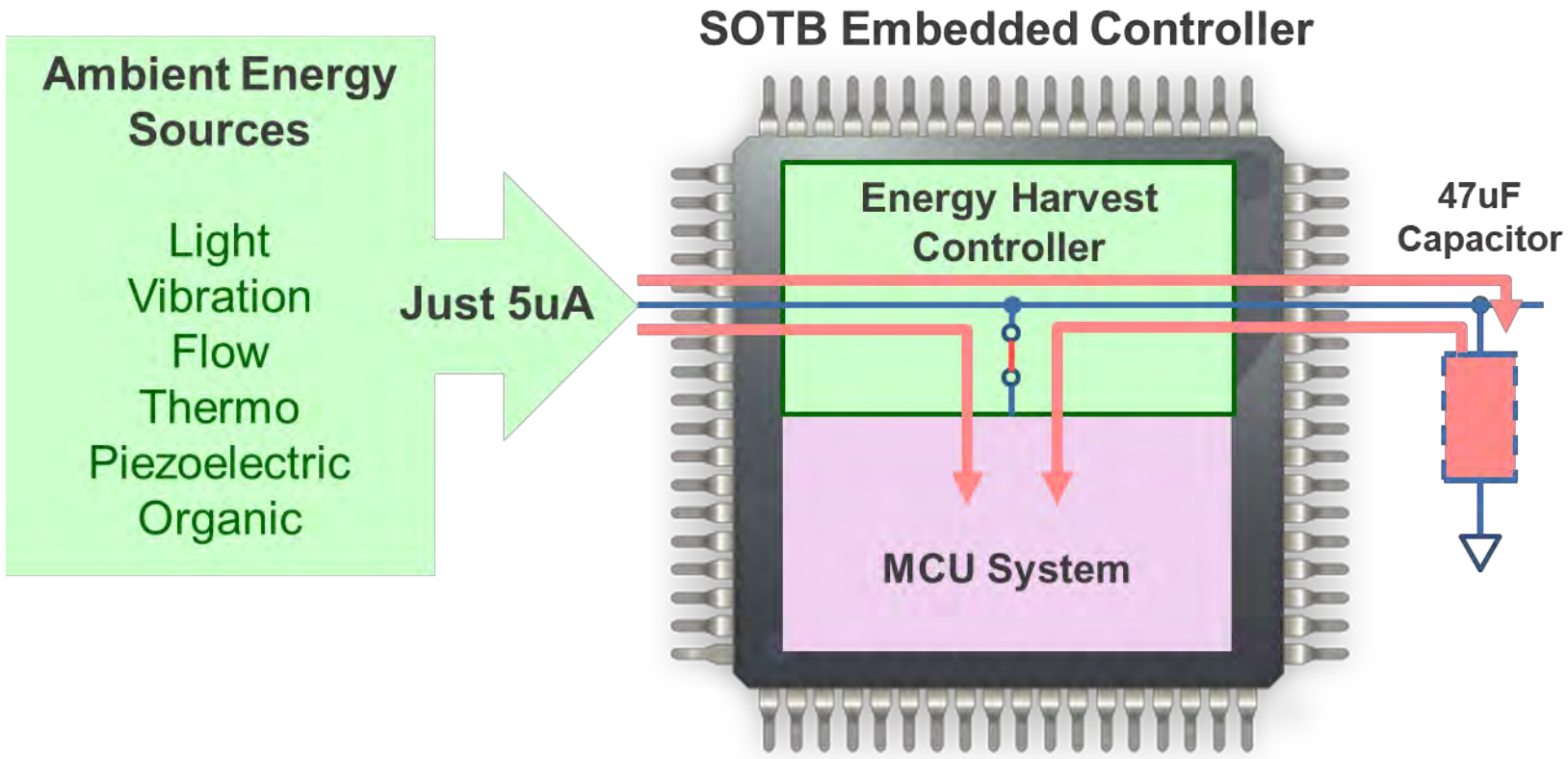
ENERGY HARVESTING CONTROLLER (EHC) MANAGES PRE-CHARGE PRIOR TO START-UP



Conventional Low-Power MCUs require external circuitry

Only 5uA from energy source is required to start device

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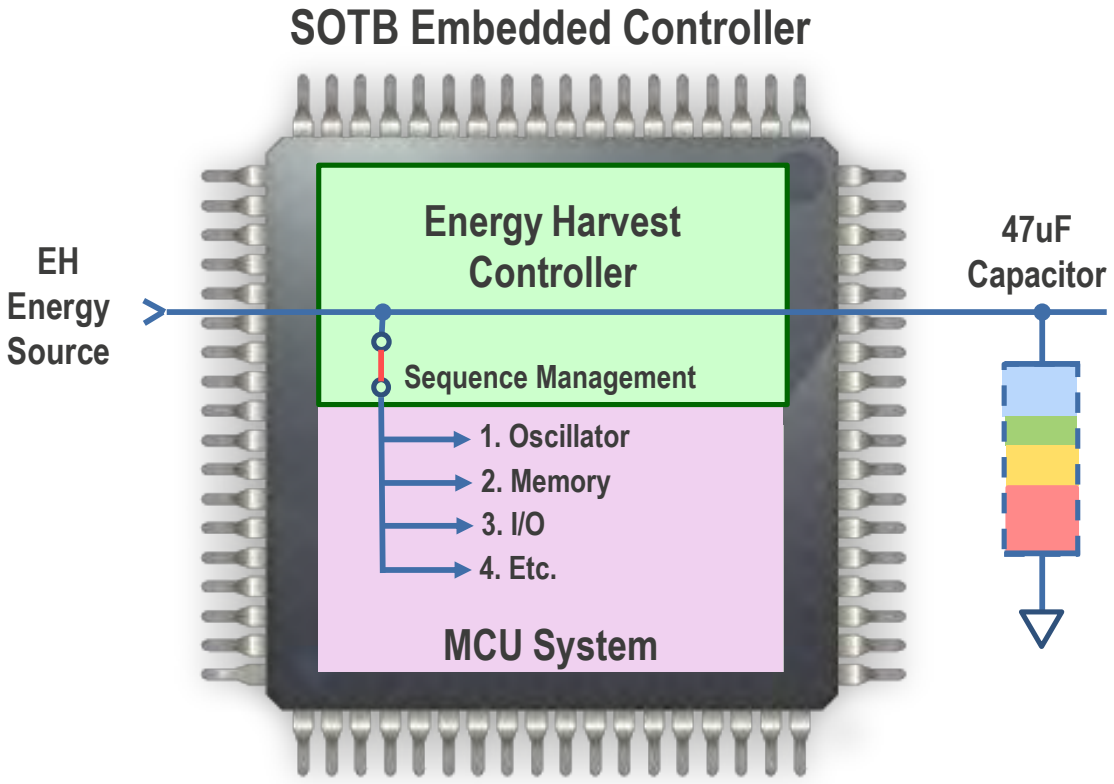
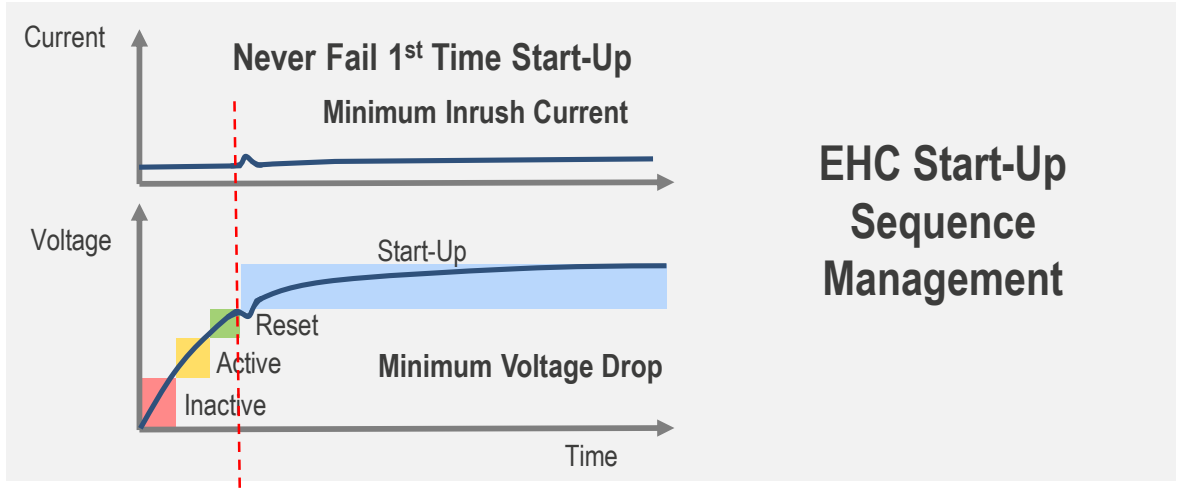
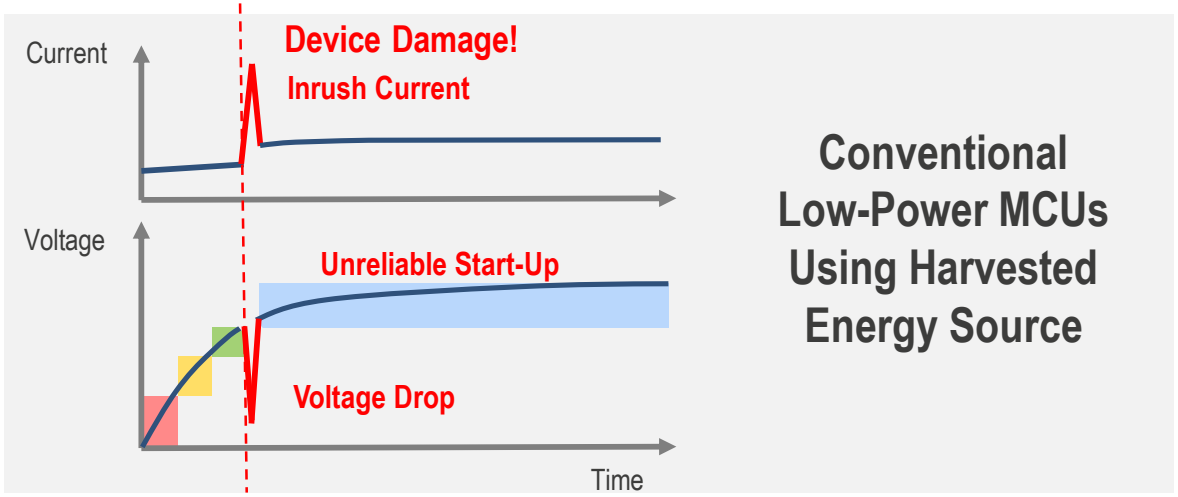
ENERGY HARVESTING CONTROLLER (EHC)

MANAGES START-UP SEQUENCE TO AVOID INRUSH CURRENT





EHC Start-Up Sequence Management



Conventional Low-Power MCUs Using Harvested Energy Source

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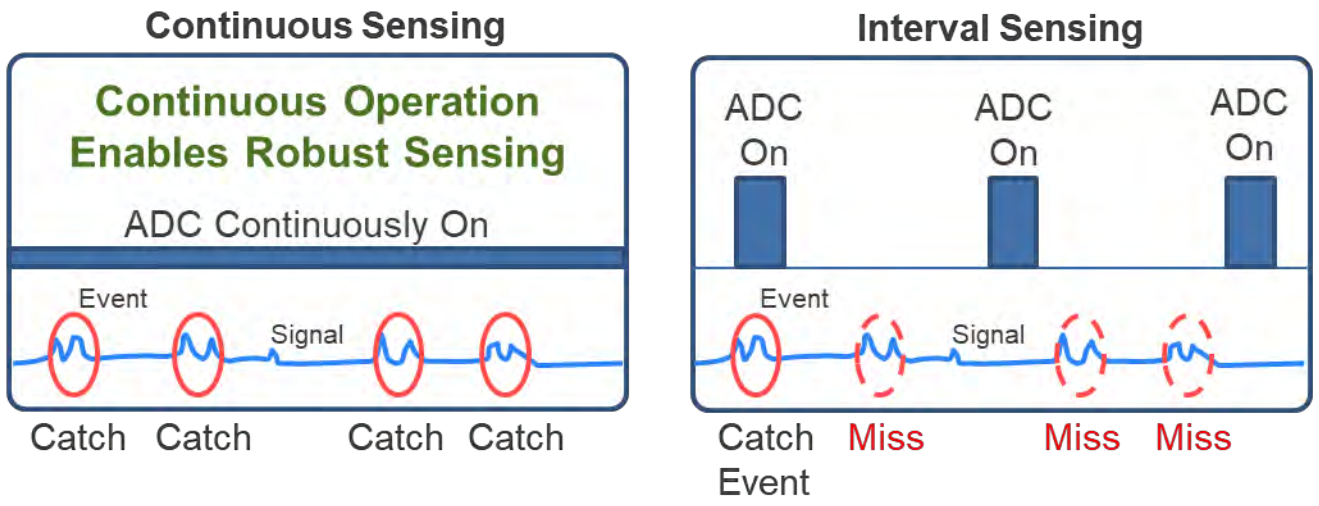
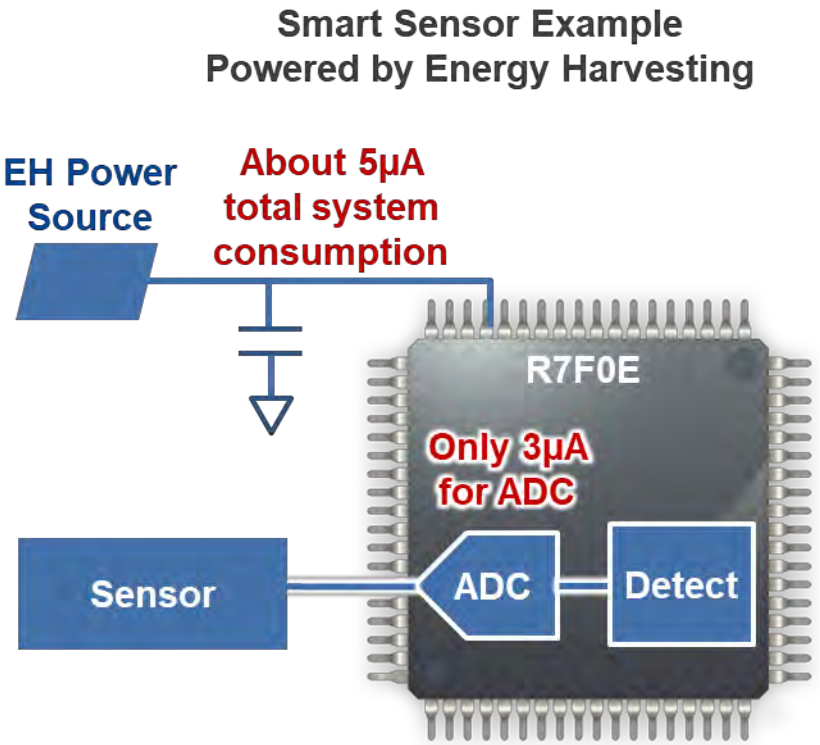
BIG IDEAS FOR EVERY SPACE RENESAS

ADC ENABLES CONTINUOUS SENSING

- Analog-to-Digital Converter (ADC) optimized for Energy Harvesting
- 14-bit, 1.6K samples per second
- Continuous operation with just 3uA current consumption
  - Approximately 1/10 that of competing MCUs
- Enables continuous sensing instead of interval sensing





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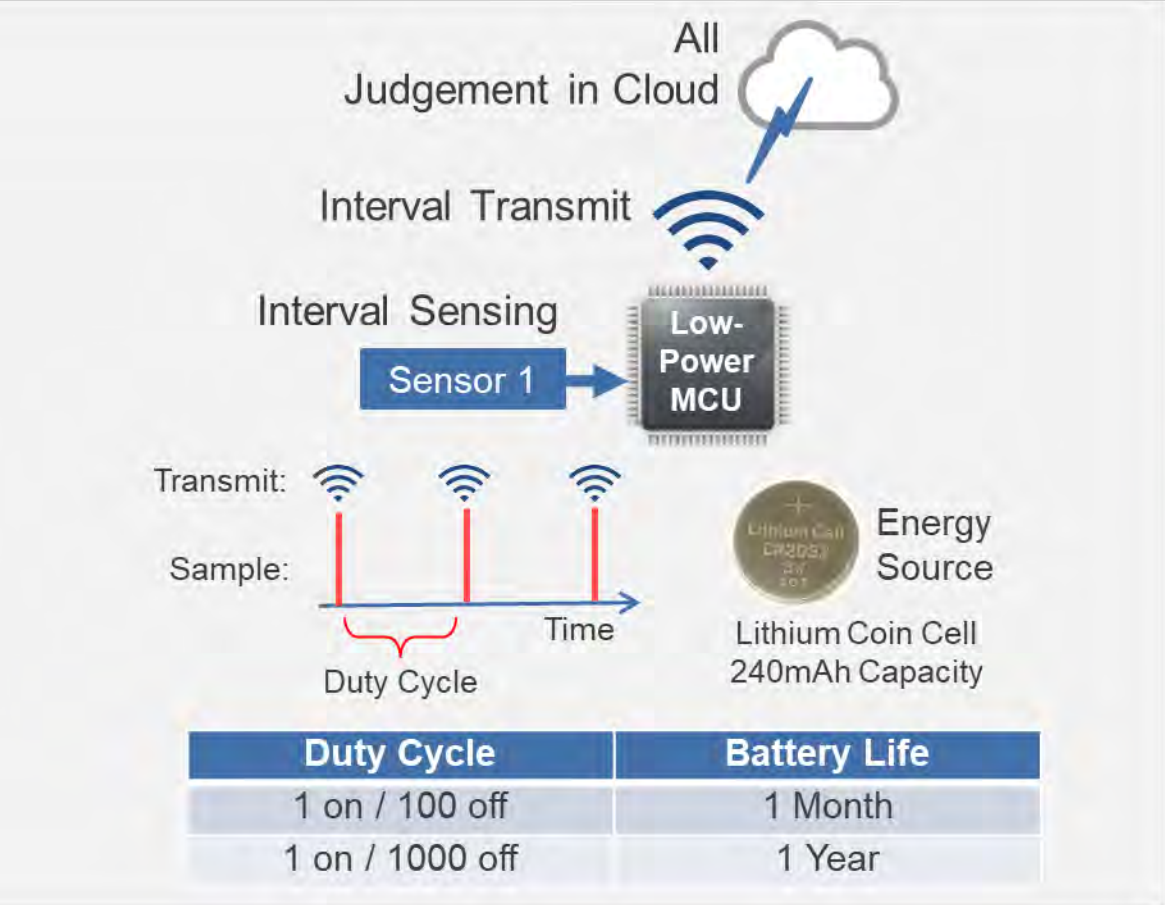
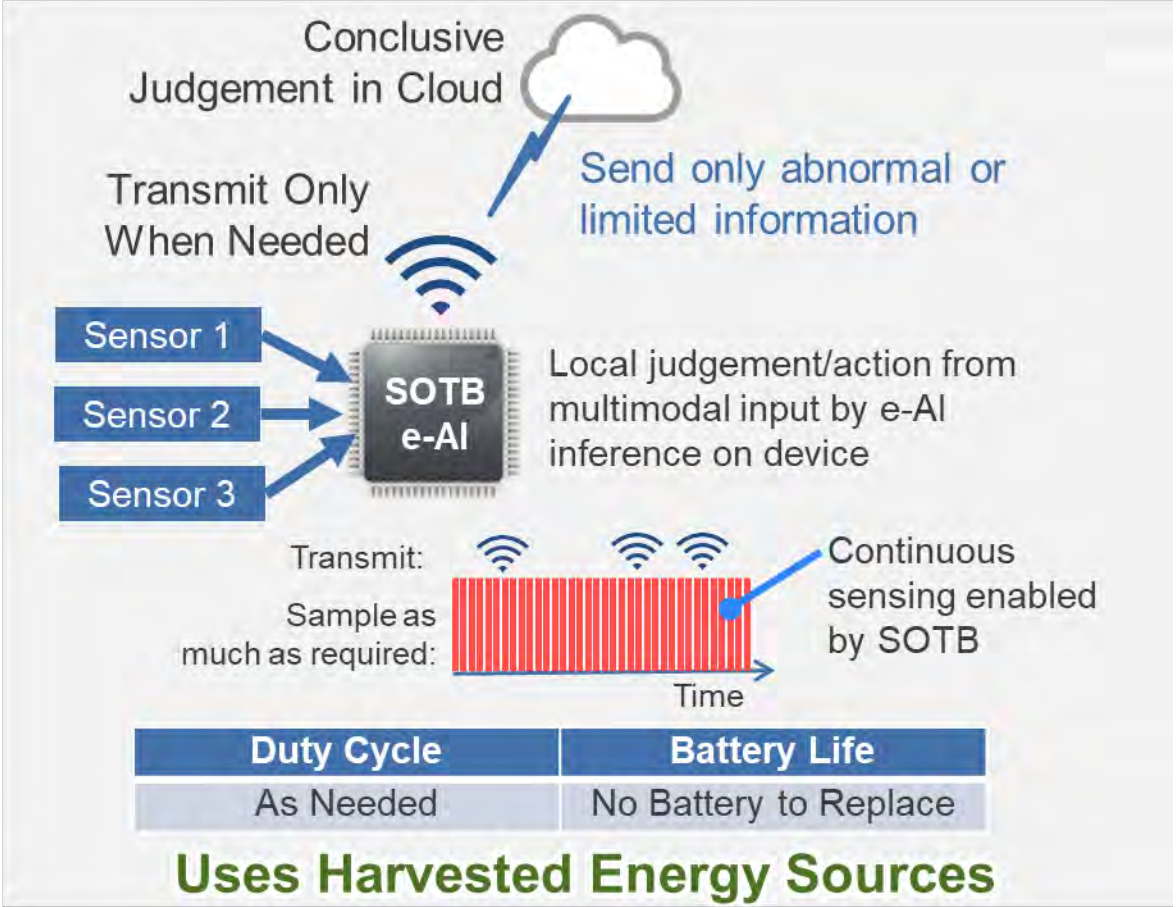
COMBINATION OF SOTB AND e-AI EXPANDS MARKET
INTELLIGENT, AUTONOMOUS, MAINTENANCE-FREE WITH EH POWER



Duty Cycle	Battery Life
1 on / 100 off	1 Month
1 on / 1000 off	1 Year



Duty Cycle	Battery Life
As Needed	No Battery to Replace

Uses Harvested Energy Sources

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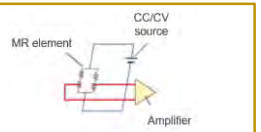
BIG IDEAS FOR EVERY SPACE RENESAS

SOTB ENERGY HARVESTING ECOSYSTEM
CHANNEL TO ENERGY HARVESTING MARKET

Sensor Fusion



Position Sensor

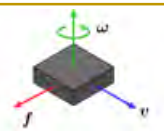

Temp/Humidity Sensor


Flow Sensor

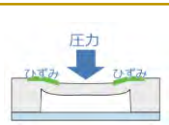

CO_2 Sensor


Accelerometer

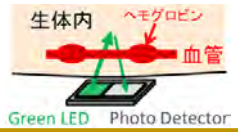

ECG



Gyro Sensor



Pressure Sensor



Pulse Sensor

Power Storage


Supercapacitor

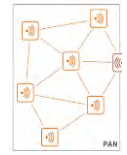

Lithium-Ion


LTO

SOTB-based Embedded Controller

Radio

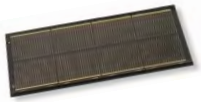
BLE


6LoWPAN

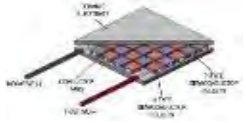
LoRa™

LPWA

Power Generator


Solar


Hydro


Thermoelectric


Rubber


Vibration


RF Harvesting


Bacteria

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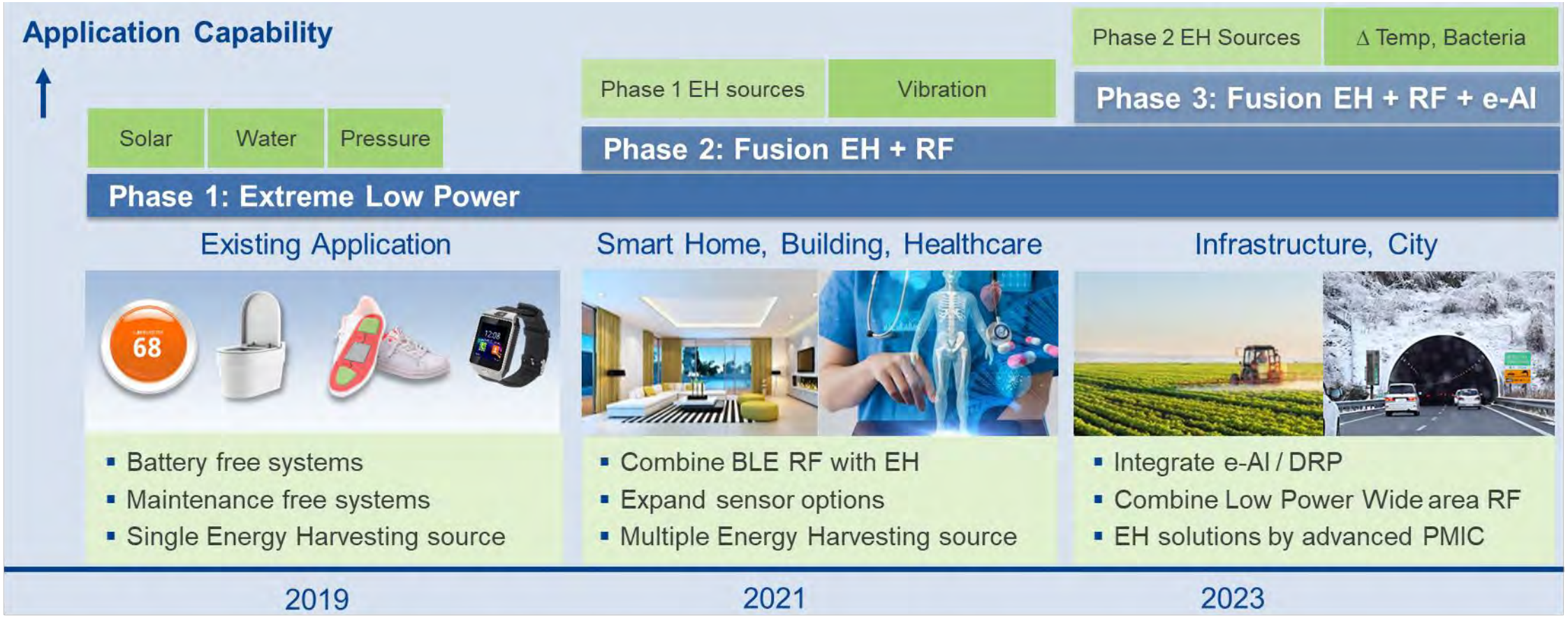
BIG IDEAS FOR EVERY SPACE RENESAS

ROADMAP OF EXTREME LOW POWER CONNECT TO EVERYWHERE – BY SOTB TECHNOLOGY



EH = Energy Harvesting RF = Radio Frequency BLE = Bluetooth Low Energy PMIC = Power Management IC

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BIG IDEAS FOR EVERY SPACE RENESAS

SOTB ENERGY HARVESTING DEMOS - ELECTRONICA 2018

Soil Monitor

ECG

Velocity Measurement (Collaboration with RICOH)

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SOTB ENERGY HARVESTING EXAMPLES – ELECTRONICA 2018
VIDEO

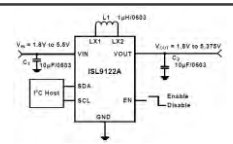
Energy Harvesting Agriculture Soil Monitor


Solar

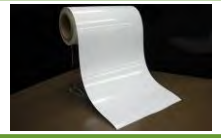

Temp/Humidity Sensor


Supercapacitor

LoRa™
LPWA


Low-iq DCDC

Battery-less Energy Harvesting ECG Heart Monitor


Solar


ECG

BLE


MIP

Battery-less Energy Harvesting Velocity Measurement


Rubber


Pressure Sensor


MIP

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SOTB MICROCONTROLLER PRODUCT OFFERING

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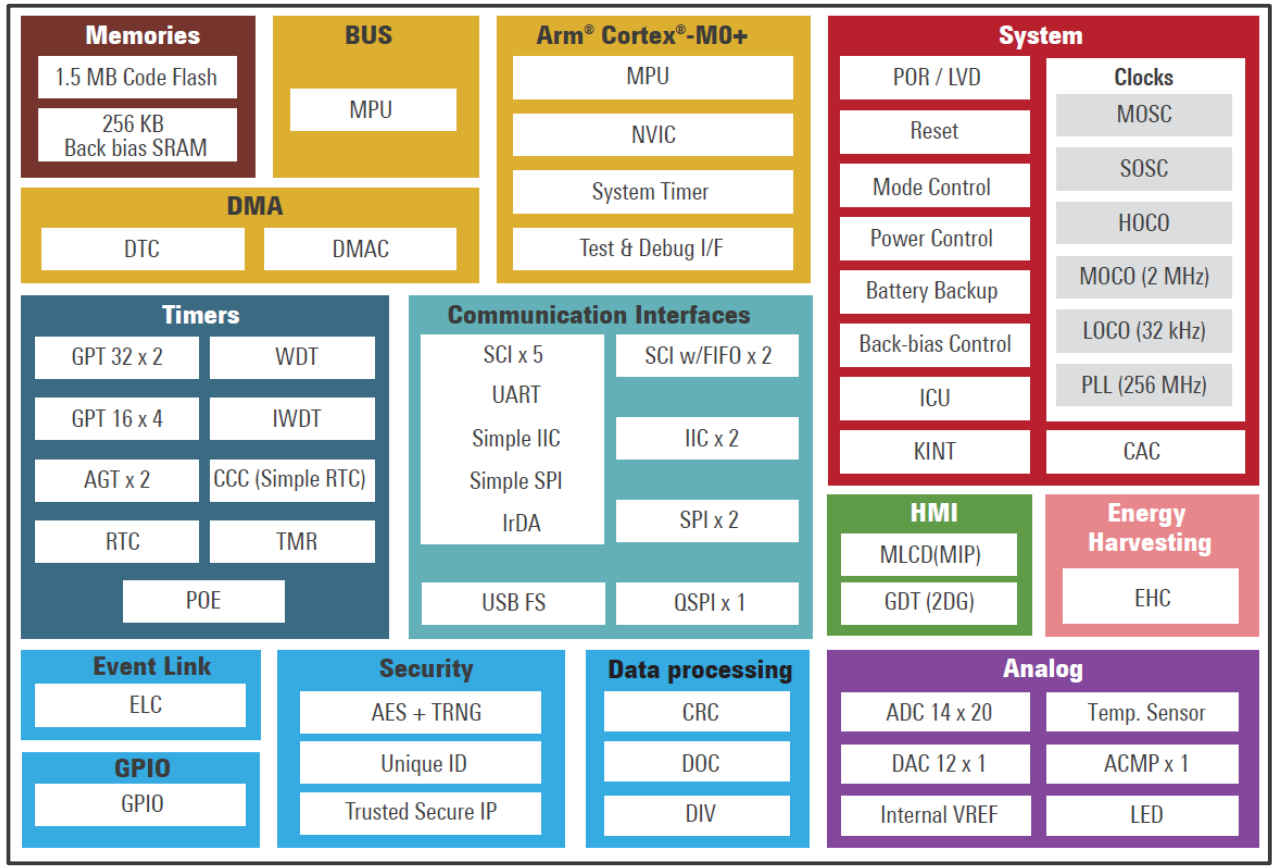
WS3 Sampling Available Now
ES Sampling Available in July '19

R7F0E SOTB EMBEDDED CONTROLLER

FIRST SOTB-BASED PRODUCT

Block Diagram



Note: Electrical Specification is not of final

- Cortex-M0+ operates up to 64MHz
- QSPI instruction fetch w/ XIP
- On-chip Oscillators
  - Low, Med, High frequencies
- 14-bit ADC, 32 kHz operation, 1.6 ksps, 3 uA consumption
- Energy Harvesting Controller for direct connection to energy devices. Enables just 5uA start up current
- 100LQFP/144LQFP/156WLBGA
- 1.62V to 3.6V operation
- SRAM retention in Standby (1nA/KB, up to 256KB)
- Current consumption
  - 25 uA/MHz Active
  - 500 nA Standby
    - CCC(Simple RTC), SOSC, POR, 32KB SRAM and core logic retention
  - 150 nA Deep Standby
    - CCC(Simple RTC), SOSC, POR

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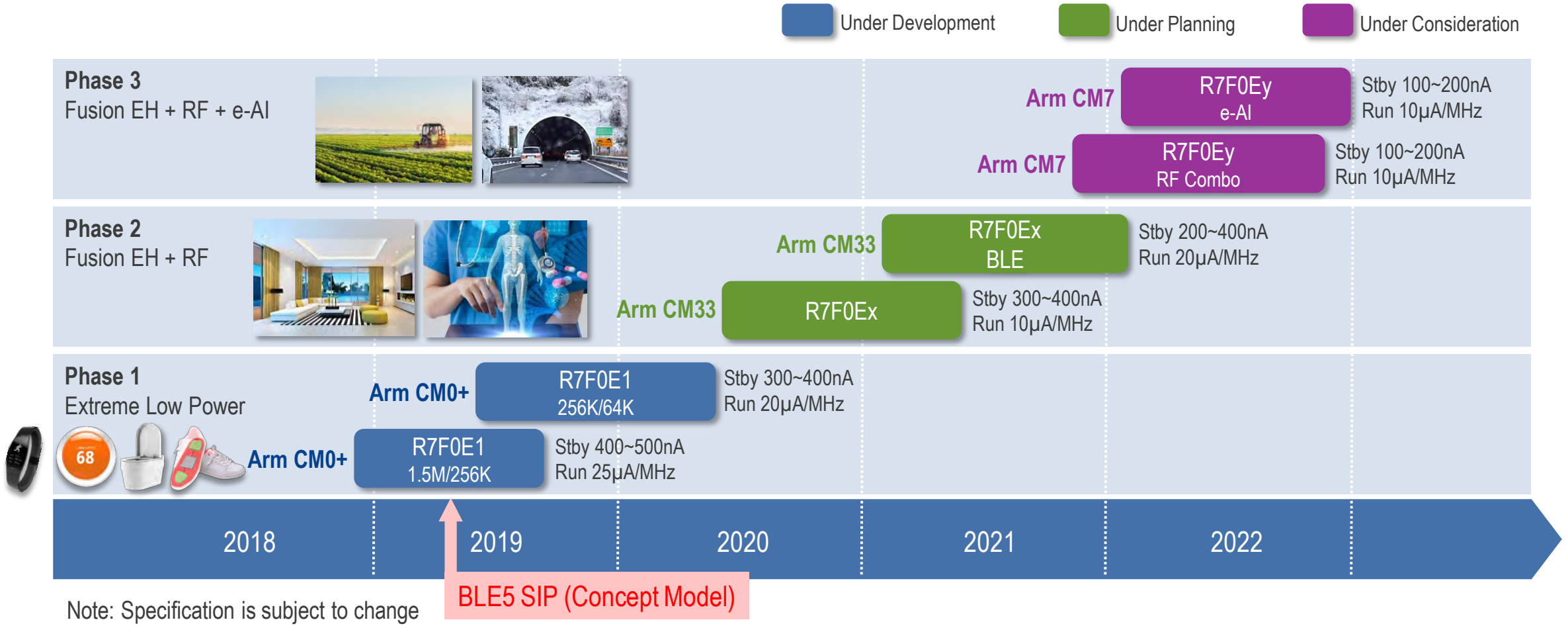
SOTB R7F0E PRODUCT ROADMAP PLAN



Note: Specification is subject to change

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SOLUTION DEVELOPMENT STATUS

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ECOSYSTEM DEVELOPMENT

R7F0E EMBEDDED CONTROLER

Complementary Software Support

Available (v0.60)

CMSIS COMPLIANT
ARM® Cortex® Microcontroller Software Interface Standard

- CMSIS Core and CMSIS-Driver
- HAL Drivers
- SVD (Device Definition File)
- Energy Harvesting Support
- Trusted Secure IP(TSIP) API
- Sample Code

Tool Support

Available

IAR SYSTEMS

- IAR Embedded Workbench
- IAR C/C++ Compiler Support
- I-jet Debugging Probe Support

Available

SEGGER

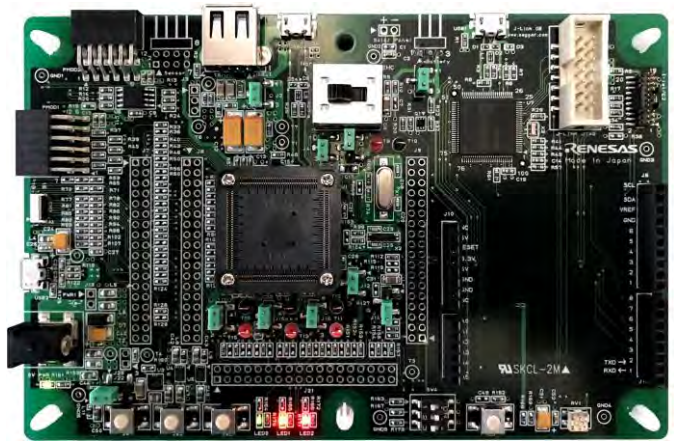
- J-Link Debugger
- J-Link OB Support

Prelim Available

RENESAS e² studio

- RENESAS e² studio
- GNU GCC Compiler Support

SOTB SDK Board

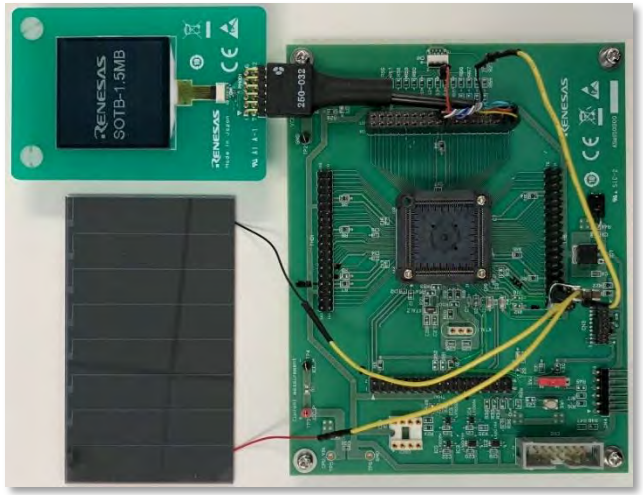


Available Upon Request (v1.0)

Available in April (v2.0)

- Energy Harvesting
- Low-power MIP LCD Support
- Low IQ DCDC
- Arduino Interface
- PMOD Interfaces
- USB Host Full-Speed
- J-Link OB Support

SOTB 'Simple' Board



Available Upon Request

- Basic Chip Evaluation
- Current Measurement
- Energy Harvesting

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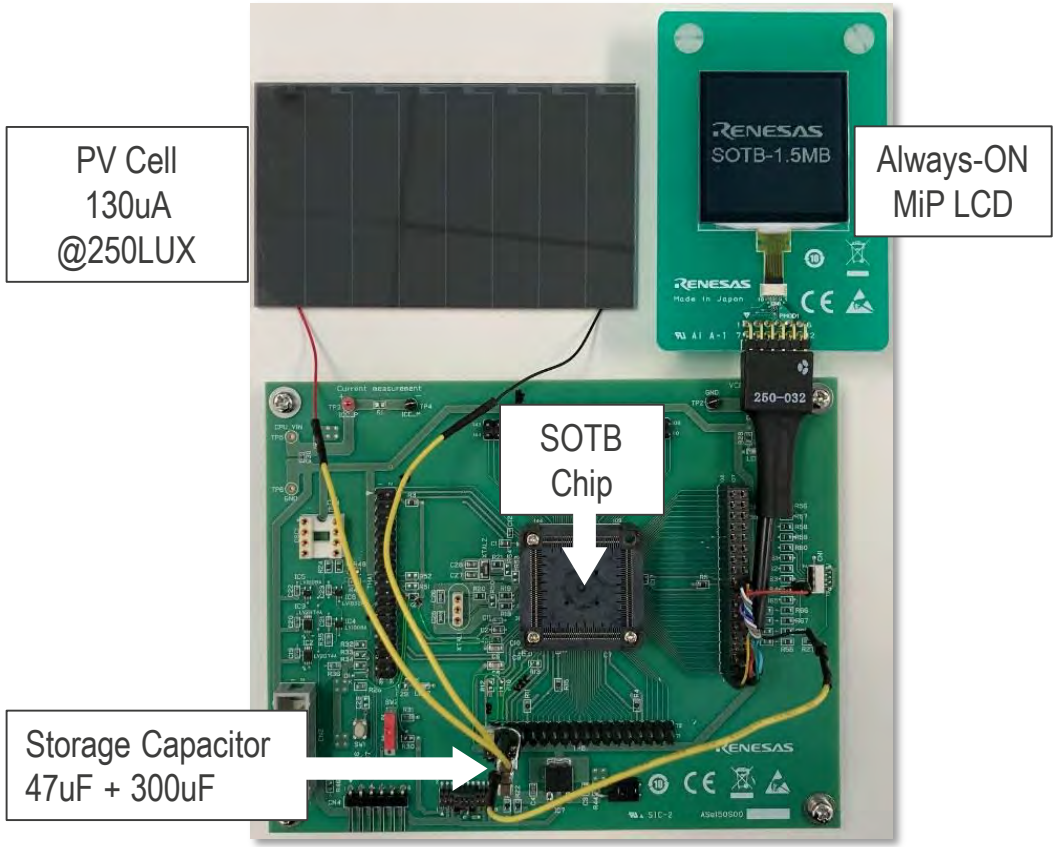
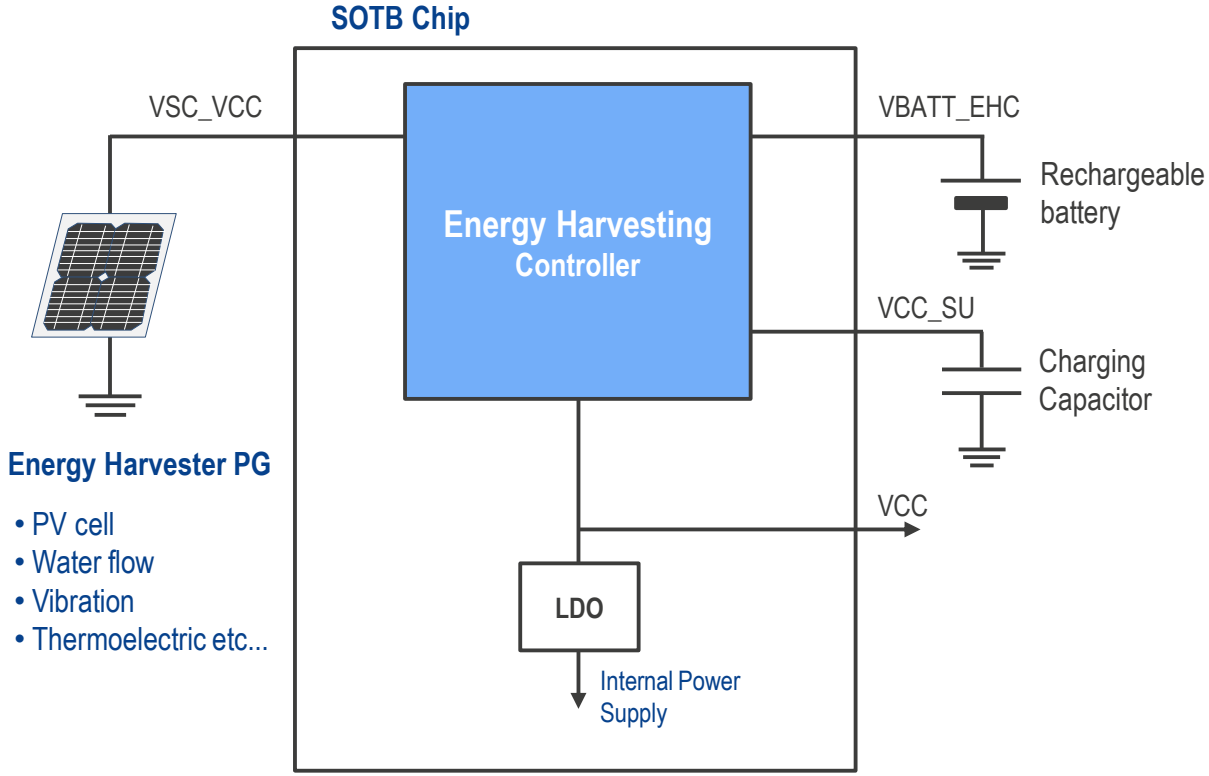
ENERGY HARVESTING EXAMPLE
ALWAYS-ON LCD DISPLAY

- MCU can bootup with only 5uA current source from EH Power Generator
- Always-ON MIP (Memory In Pixel) LCD Display with a PV Cell for Indoor Luminosity





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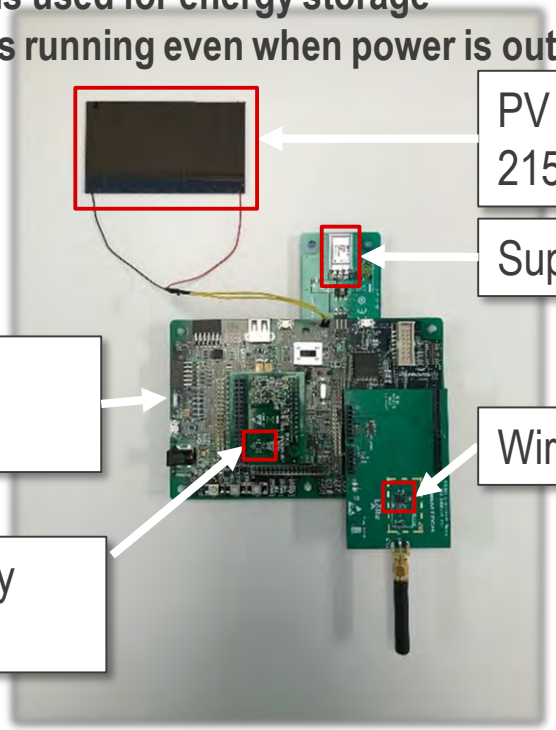
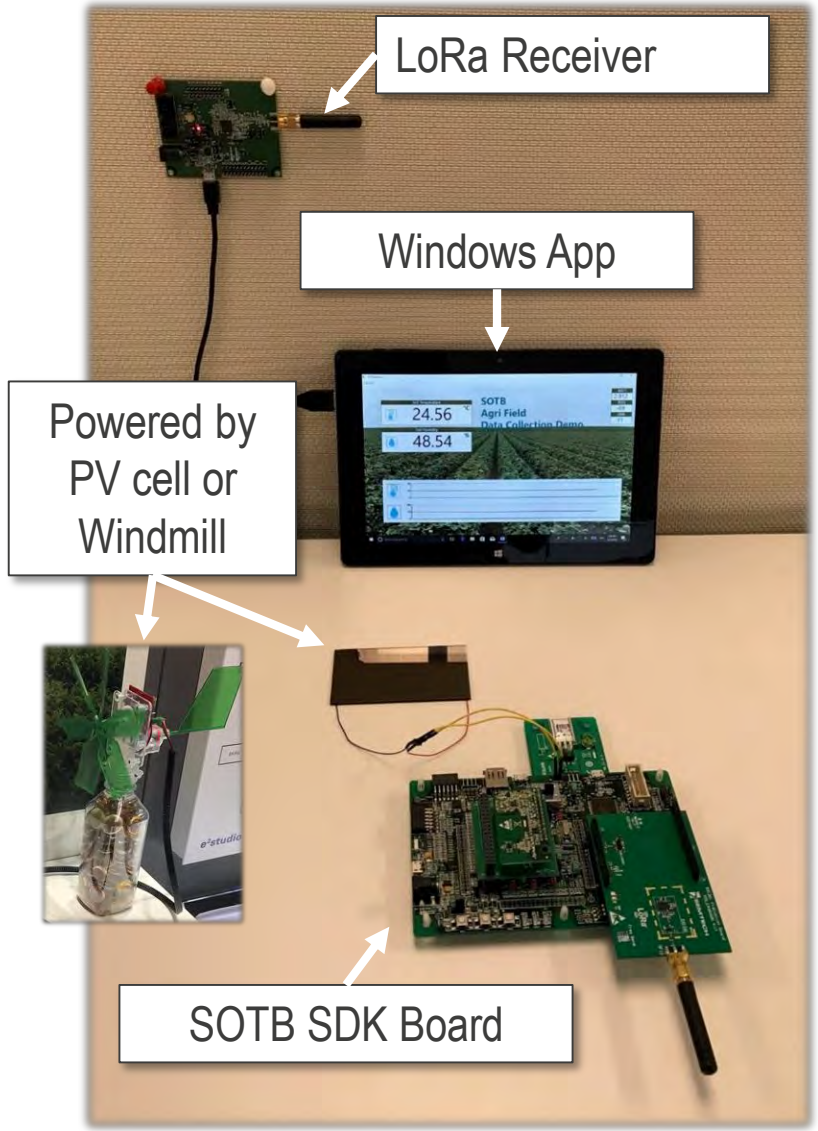
BATTERY-LESS AGRICULTURE SOIL MONITOR DEMO

- PoC Demo for Energy Harvesting Wireless Sensing
- Powered by a PV Cell or Windmill Power Generator
- Intermittent operation in 30sec ~ 1minuite
- Sensor data transmission over LoRa
- Super Cap is used for energy storage
- Demo keeps running even when power is out





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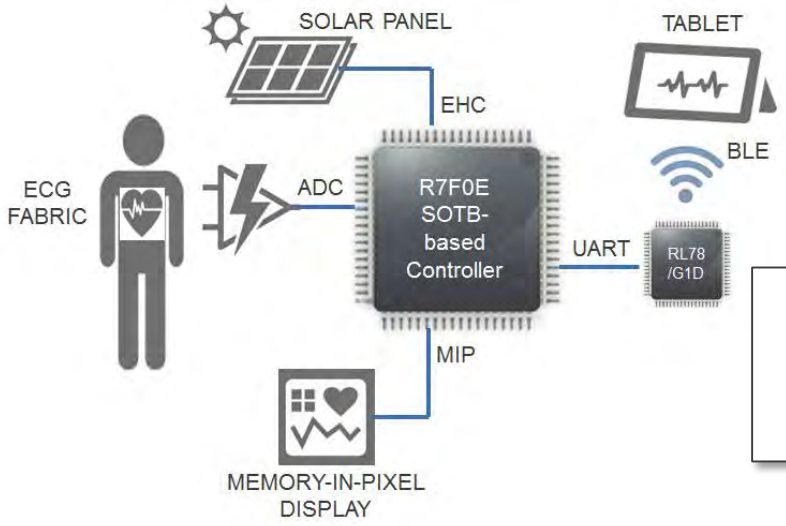
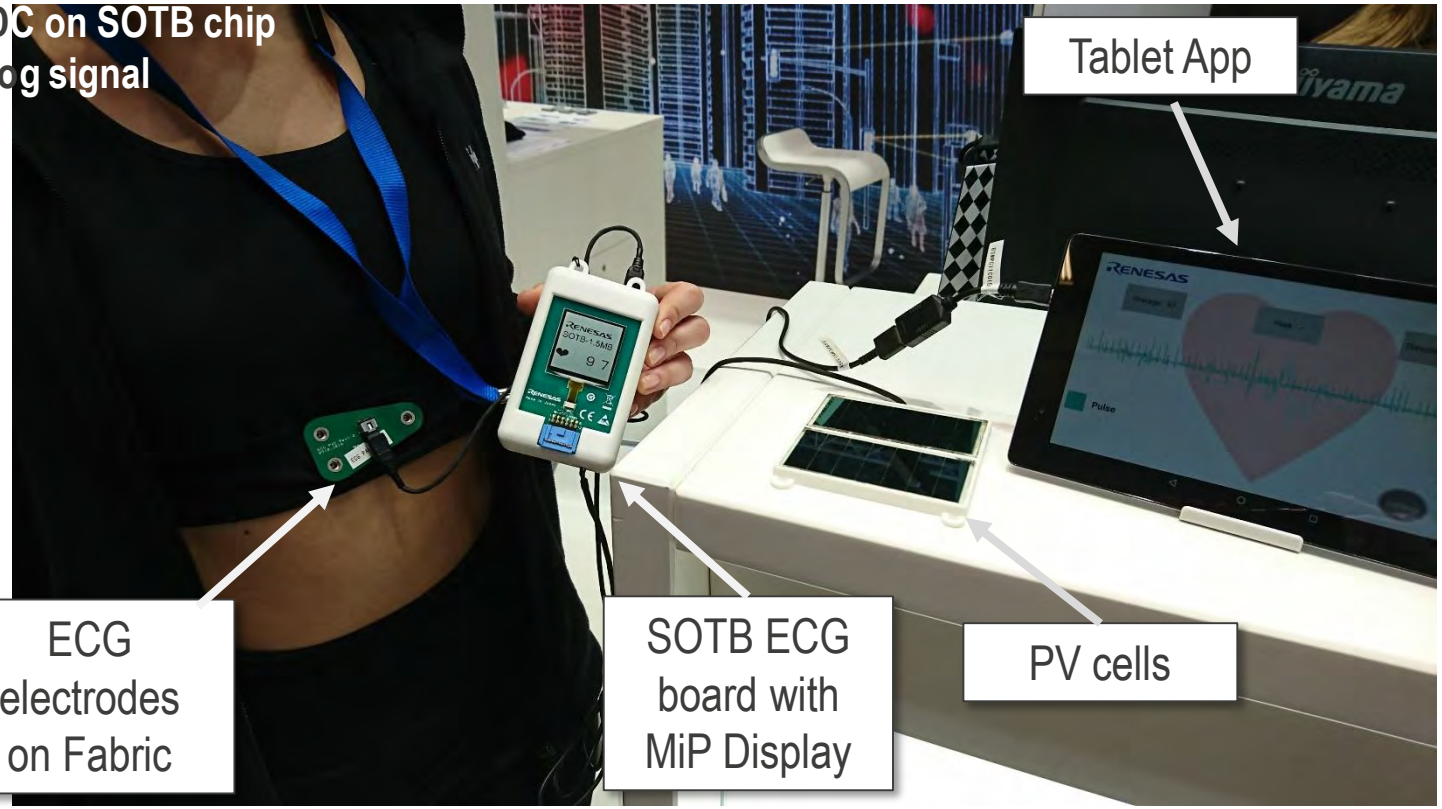
BATTERY-LESS ECG DEMO

- PoC Demo for ECG (Heart Rate Monitoring) powered by PV cells
- PV cell is going to be printed on Fabric
- ECG analog signal is sampled by 14-bit ADC on SOTB chip
- Ham-noise filtering on SOTB for ECG analog signal
- Heart Rate is displayed on MiP display
- Heart Rate is transmitted wirelessly with RL78/G1D for BLE





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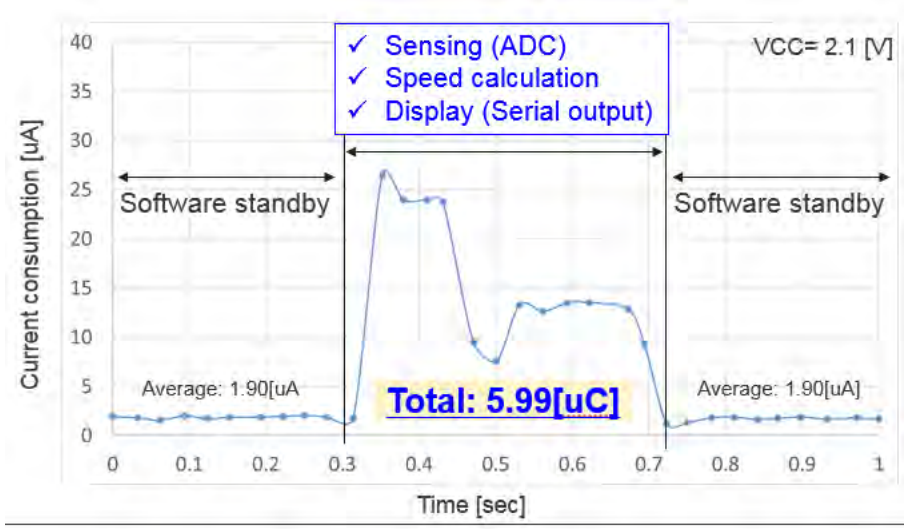
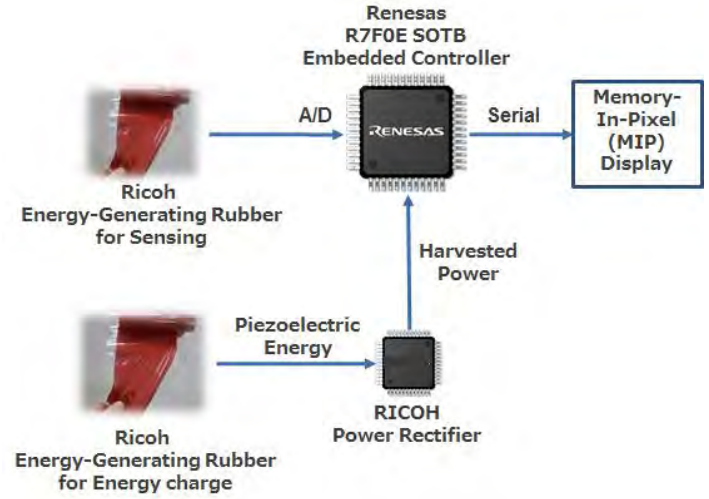
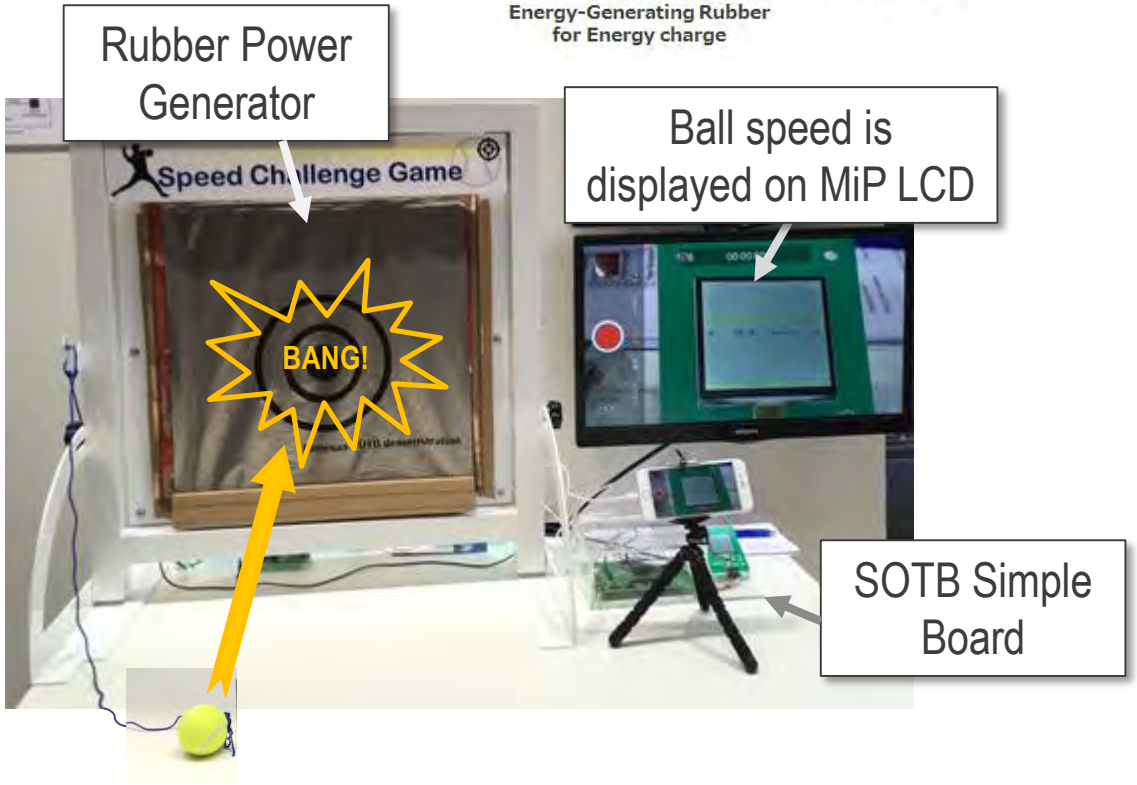
BATTERY-LESS SPEED MEASUREMENT DEMO

- Ball Speed Measurement Demo
- A Rubber Power Generator is used (Piezoelectric)
- Demo is powered by the rubber PG when a ball hits on the rubber sheet
- SOTB chip senses, calculates, and displays image on MiP LCD with just 6uC







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SCHEDULE

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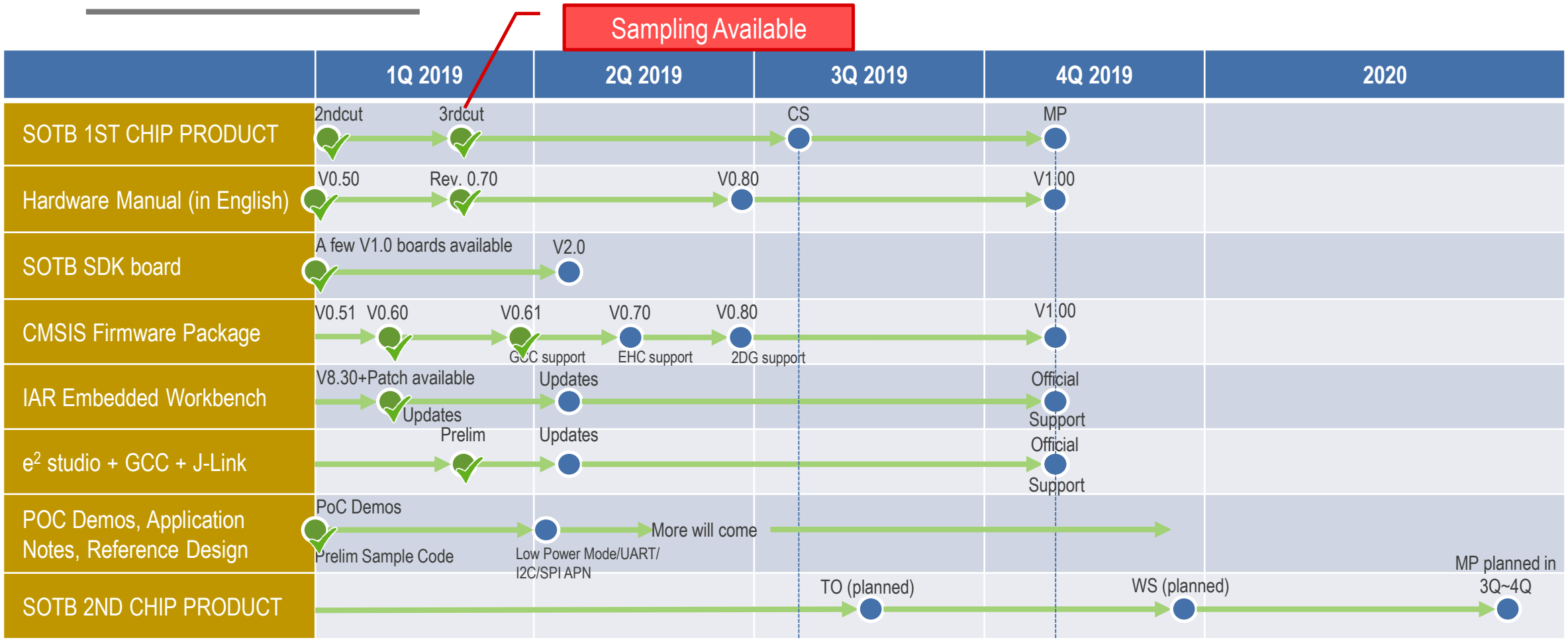
SOTB ECOSYSTEM SCHEDULE



Note: Schedule is subject to change

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APPENDIX

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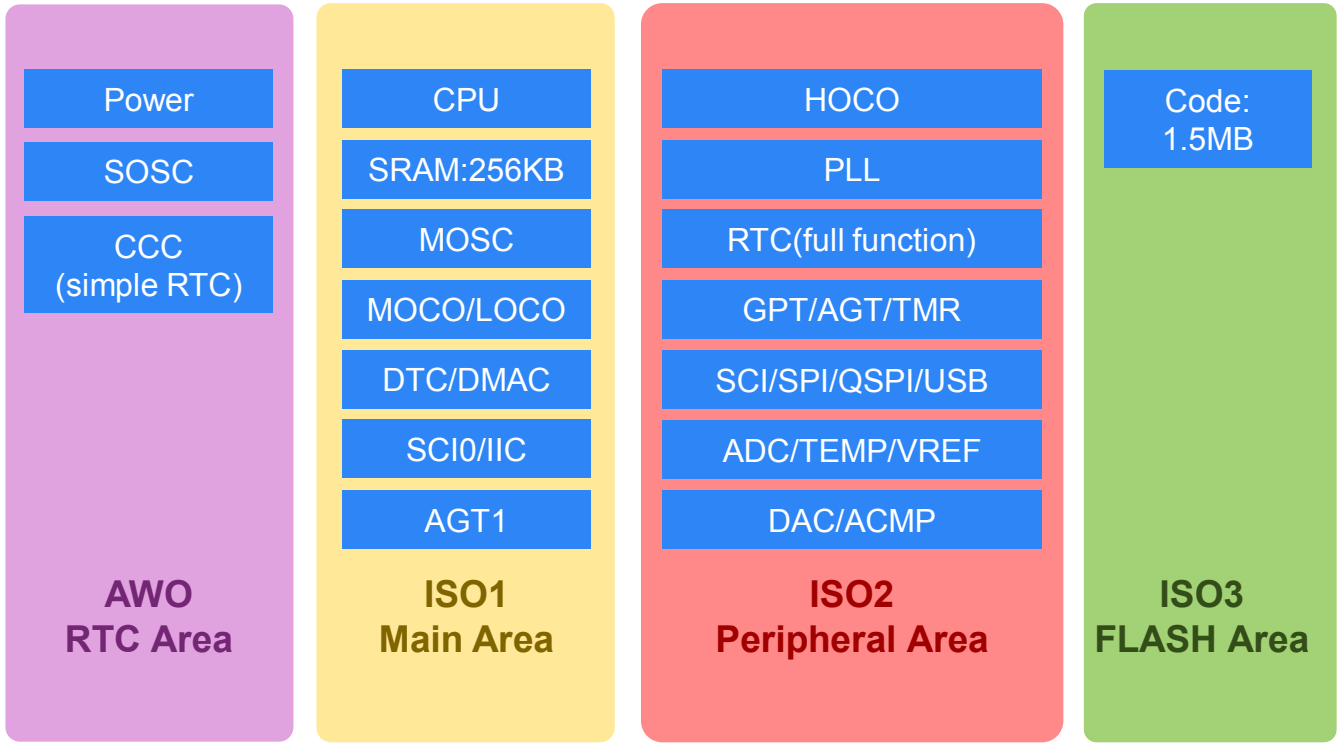
LOW POWER OPERATION

Various low power mode available with power gating



	AWO	ISO1	ISO2	ISO3
ALLPWON BOOST/NORMAL/VBB OPE/SLEEP	On	On	On	On
EXFPWON NORMAL/VBB OPE/SLEEP/SSTBY	On	On	On	Off
MINPWON NORMAL/VBB OPE/SLEEP/SSTBY	On	On	Off	Off
Deep-standby	On	Off	Off	Off

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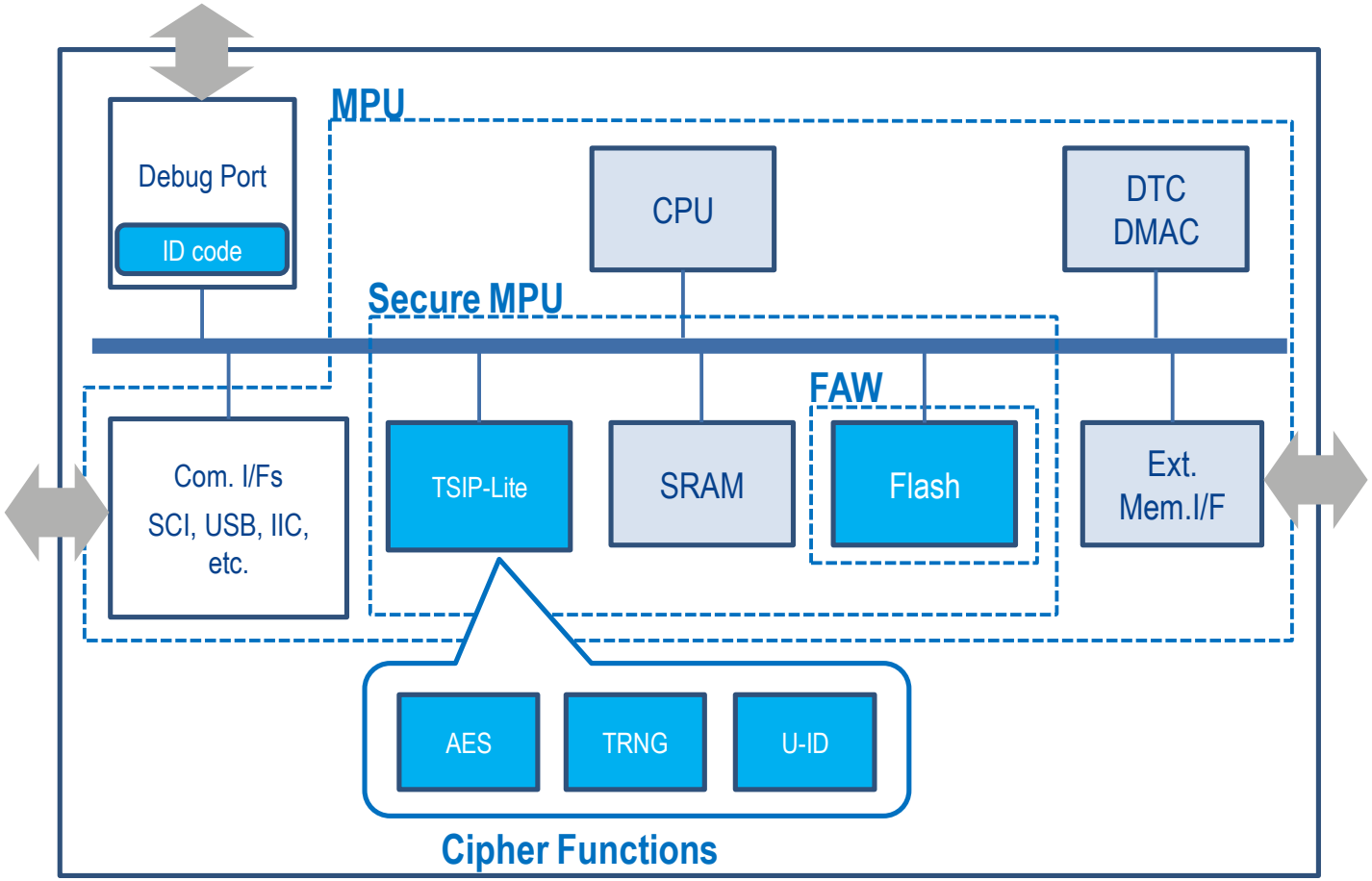
OVERVIEW OF SOTB MCU SECURITY ARCHITECTURE

- Secure Peripherals
- Crypto Engine – Trusted Secure IP-Lite
  - AES
  - T-RNG
  - Chip Unique ID
  - Key Access Management
- Flash Access Window (FAW)
- Memory Protection Unit (MPU)
- Secure MPU
- ID code protection (Debug port)



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SENSOR OVERVIEW

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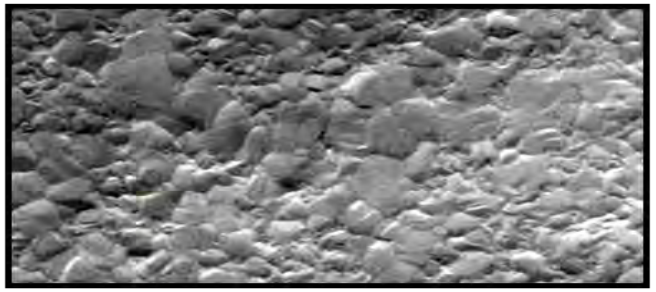
METAL OXIDE (MOX) SENSOR PRINCIPLES

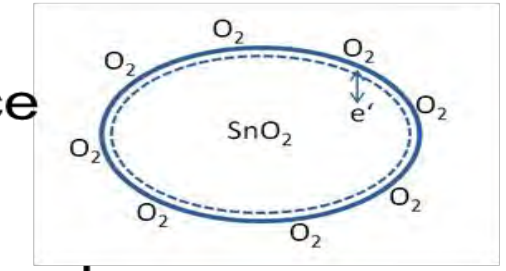
- Working Principle of Chemiresistor
  - Gas generates free charge carriers in MOx
  - Changes resistance of MOx



Fired Material at 800°C

- Influences to MOx Resistivity
  - Temperature
  - Gases (present atmosphere)
  - Oxygen Concentration
  - Surface geometry (particle shape & production technology)

- Chemisorption reaction on surface of MOx
  - Oxygen is adsorbed at different phases on MOx surface
  - Gas molecules arrive and adsorb on sensor surface
  - Reaction between gas and oxygen
  - Oxygen equilibrium on surface is disturbed, transferring charge



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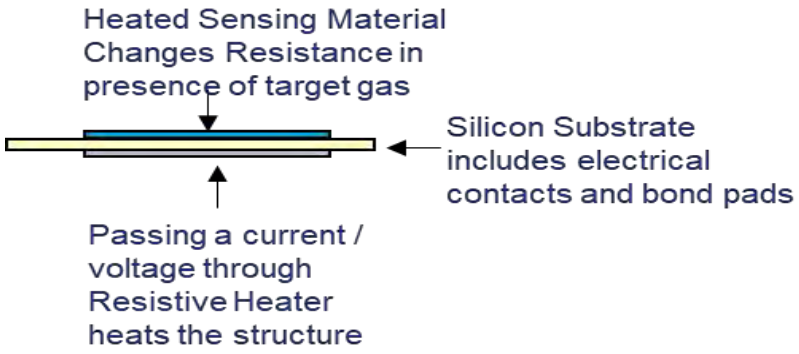
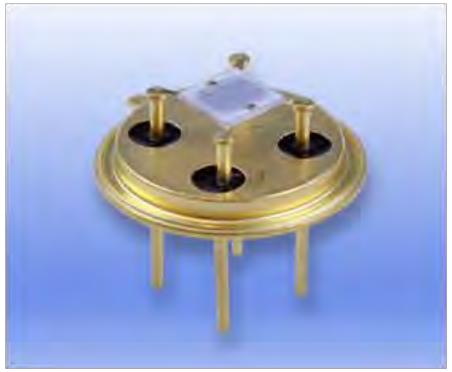
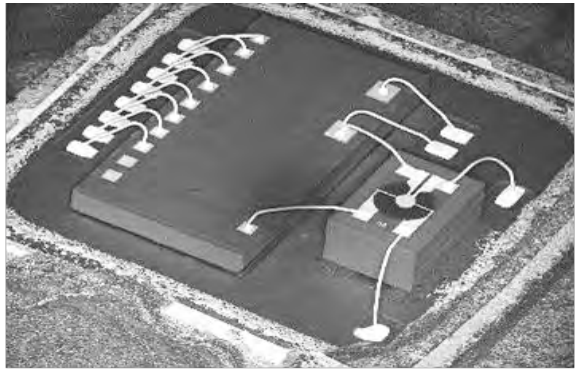
IDT'S MOX GAS SENSOR TECHNOLOGY



Working Principle



Ceramic-based
Analog Gas Sensor



Silicon-based
Digital Gas Sensor

- Sensors reliably measure gases in air
- Fast response and recovery to gas
- Excellent stability and sensitivity
- Sensors operate via diffusion or active flow

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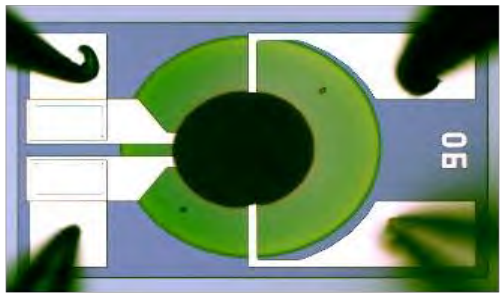
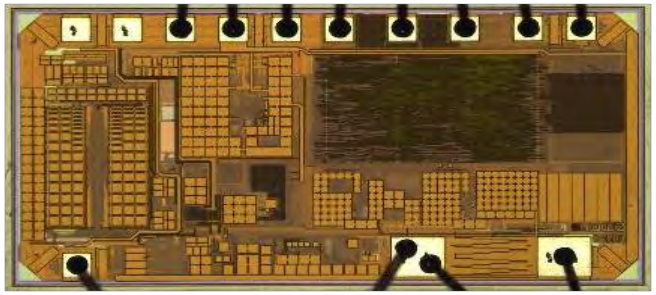
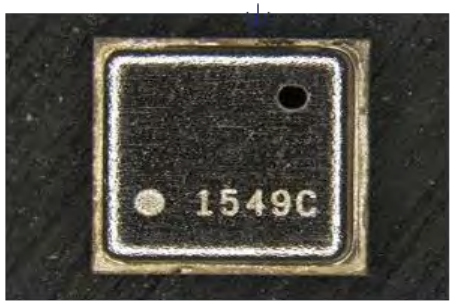
ZMOD4XXX COMBINES PROVEN ELEMENTS IN A SYSTEM



Si-based Micro hotplate
with Metal Oxide coating

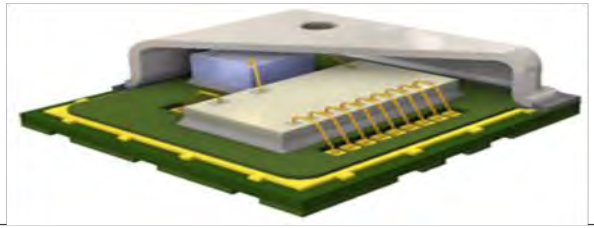


ZSSC3250 ASIC
for I²C output



Package with Gas Inlet

- ✓ Upgradeable platform leveraging multi sequence flexibility
- ✓ MOx material with 12 years of experience, proven stability
- ✓ Calibrated solution with easy I²C integration



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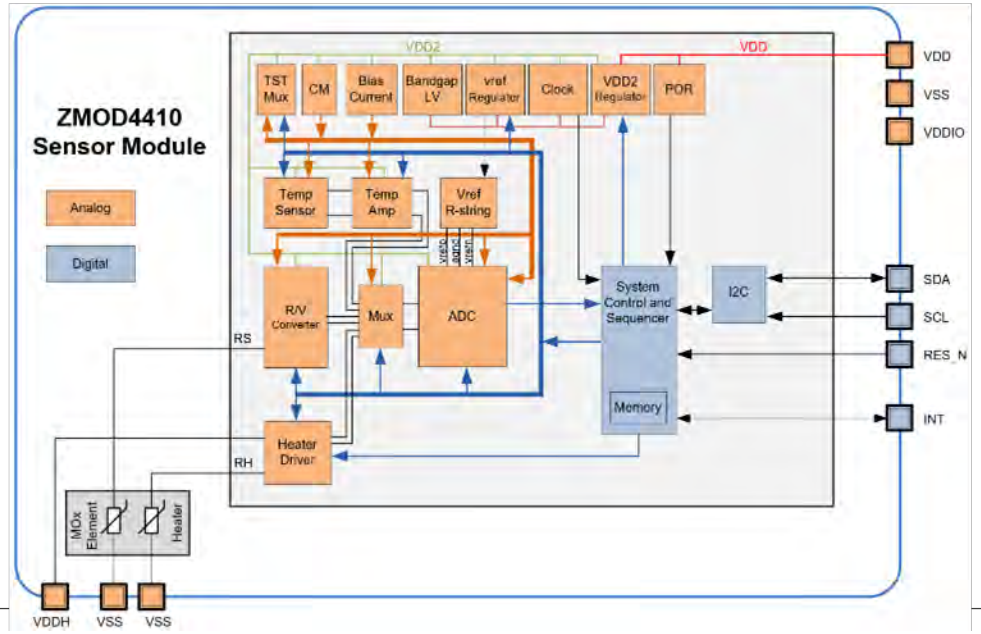
ASIC FLEXIBILITY AND SENSOR PERFORMANCE

- Accurate heater temperature control (±0.5K)
- Digital communication with I²C interface with up to 400kHz
- ADC resolution: adjustable for speed and resolution (max.16-bit)
- Tailored temperatures enable sensitivity to target gases and selectivity
- New products and features via software upgrade to ASIC settings



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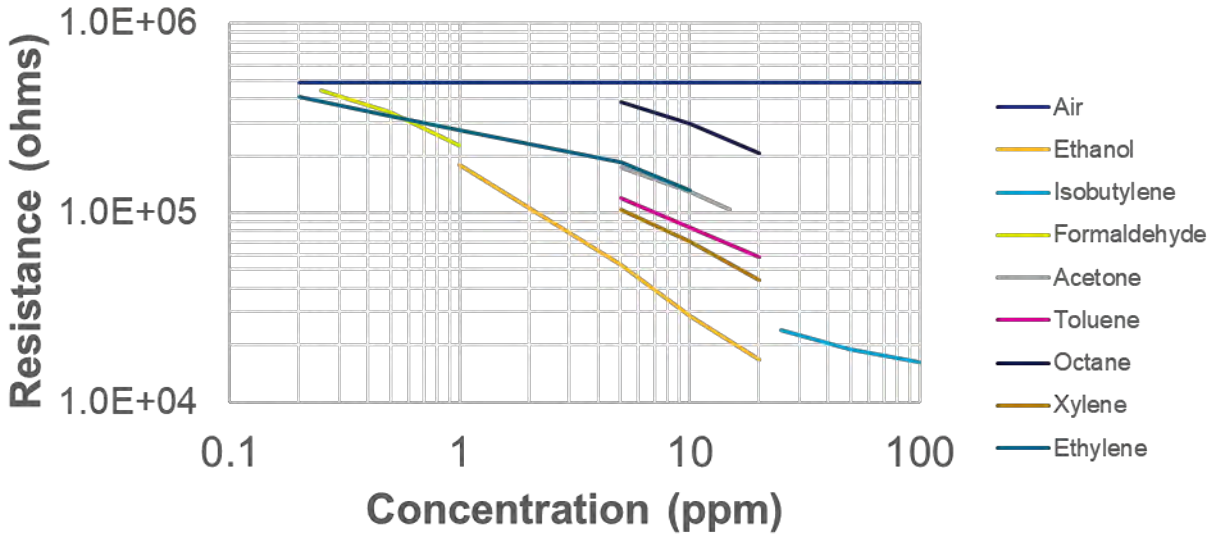
SENSITIVITY TO DIFFERENT VOCS

Sensitivity influenced by

- MOx materials
- Operation method (temperature, duty cycle)



Results used in

- IDT Source code and algorithm provided as API and pre-compiled code libraries

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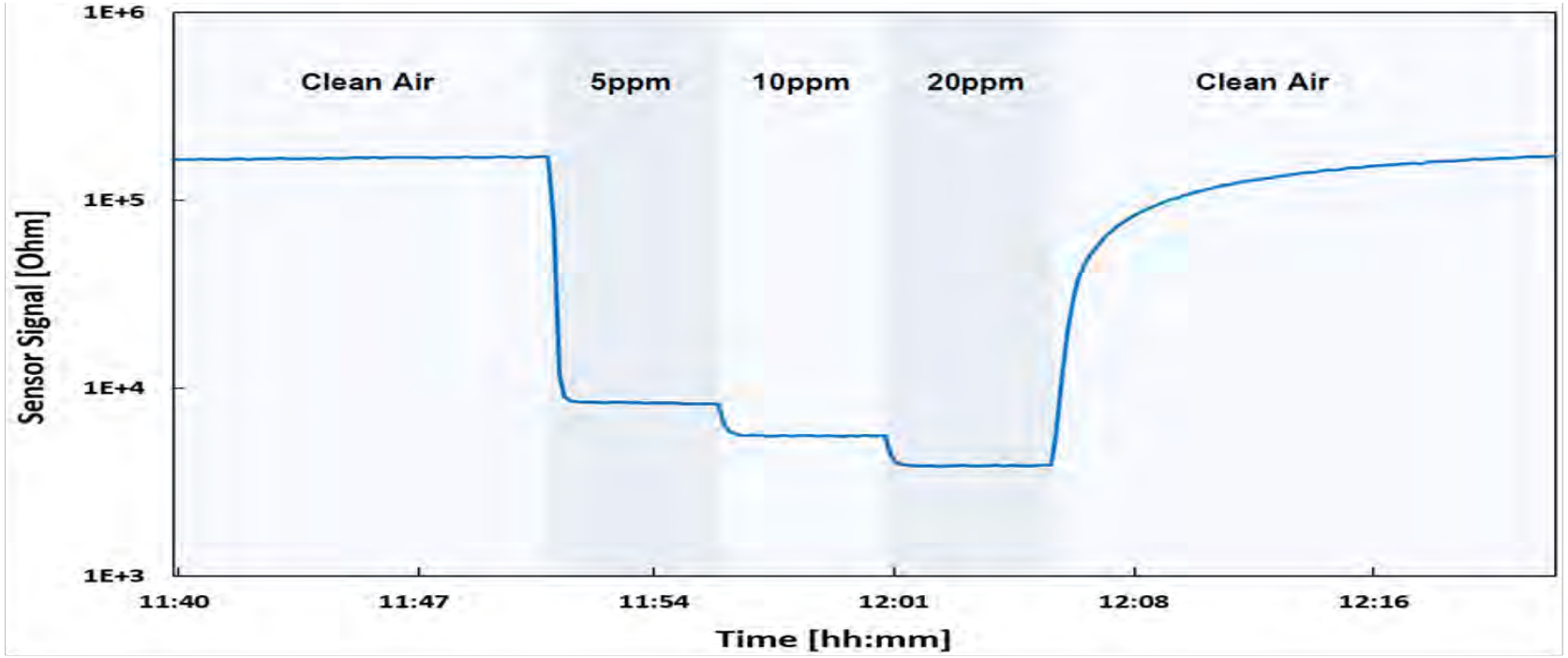
SENSOR RESPONSE TIME (TVOC)



- Average Response Time to 90% Full Scale: **7 seconds**
- Influenced by
  - Test Chamber and Tubing (dead volume)
  - Gas Flow Rate
  - Sensor Sampling Rate

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TYPICAL SYSTEM INTEGRATION

Detection of Target Gases

ZMOD4410: Method of operation TVOC

IDT Precompiled Code on Customer Microcontroller

µC Platforms* Supported
Renesas
ARM – Renesas
Synergy
Linux
Windows

*additional Microcontroller platforms to be added

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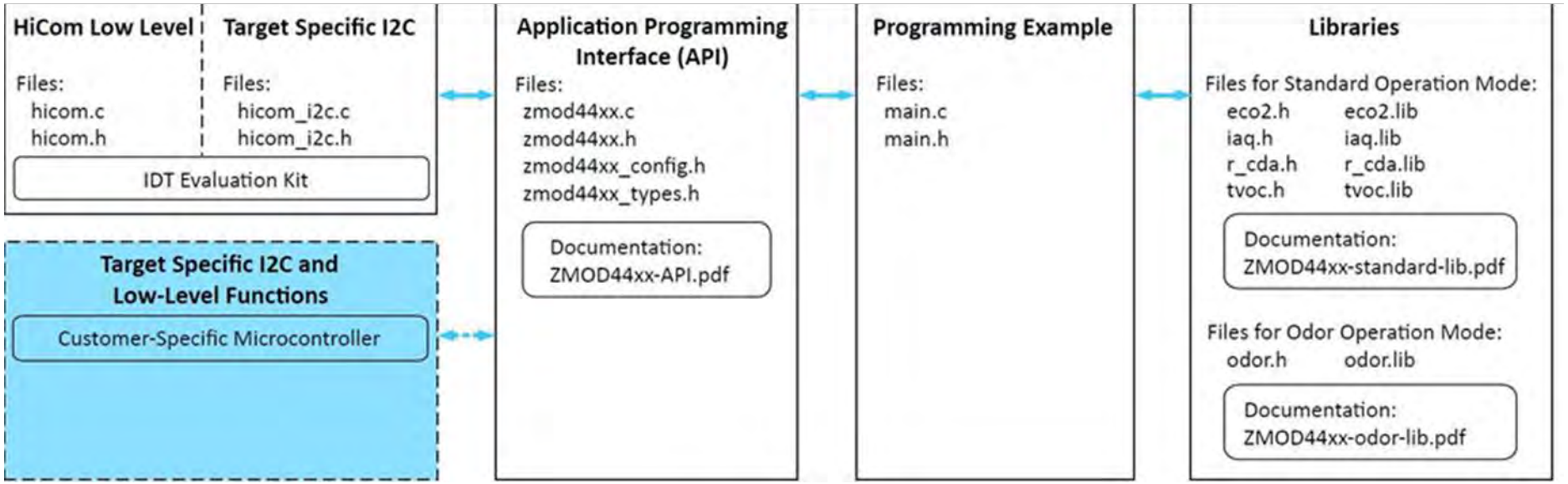
SOFTWARE INTEGRATION

IDT examples of API's

IDT Precompiled Libraries



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ZMOD4410 PRODUCT SNAPSHOT

Features

- Proven MOx Material
- Electrical and Gas calibrated
- Flexible architecture with available GUI and firmware for different operation modes
- Correlates German Committee on Indoor Guidelines (UBA study)
- Miniature 3 x 3 x 0.7mm
- Power consumption of <1 mW in Low Power operation
- Digital (I^2C) output
- Siloxane resistant

Benefits

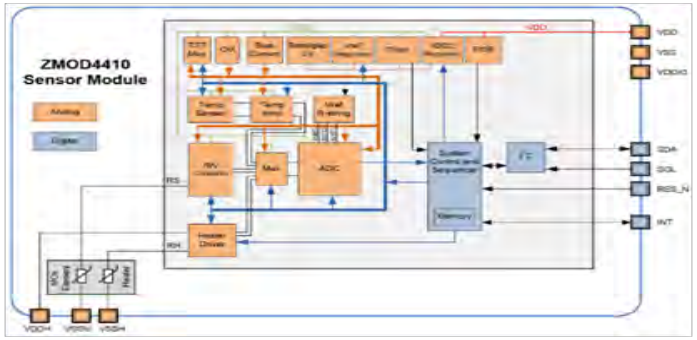
- Leading high sensitivity and long term stability
- Calibrated sensor allows easy and fast system integration
- Enables Customer to release product families via SW changes
- International accepted definition of Indoor Air Quality (IAQ)
- Calculation of estimated Carbon Dioxide (eCO2)
- Reduced end product size

Applications

- HVAC Systems
- Air Purifiers
- Smart Thermostats
- Smart Speakers
- Bathroom fans
- Kitchen exhaust hoods
- Smart outlets & receptacles

Best Performance in Stability and Sensitivity

Block Diagram



IAQ Indication

IDT IAQ Rating	Reference Level	Air Information	TVOC (mg/m³)	Air Quality
≤ 1.99	Level 1	Clean Hygienic Air (Target value)	< 0.3	Very Good
2.00 – 2.99	Level 2	Good Air Quality (if no threshold value is exceeded)	0.3 – 1.0	Good
3.00 – 3.99	Level 3	Noticeable Comfort Concerns (Not recommended for exposure > 12 months)	1.0 – 3.0	Medium
4.00 – 4.99	Level 4	Significant Comfort Issues (Not recommended for exposure > 1 month)	3.0 – 10.0	Poor
> 5.00	Level 5	Unacceptable Conditions (Not recommended)	> 10.0	Bad

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HS300X PRODUCT SNAPSHOT

HUMIDITY SENSOR WITH INDUSTRY LEADING ACCURACY, RESPONSE TIME, AND EXCELLENT STABILITY

Features

- ±1.5% Relative Humidity Accuracy (HS3001)
- Fast RH response time (Typical 6 seconds)
- 14-bit resolution, 0.01%RH (Typical)
- Low power consumption, 1.0µA average (one RH + T measurement per second)
- Temperature sensor accuracy of ±0.2° C (HS3001, HS3002)
- Extended supply voltage, 1.8V to 5.5V

Benefits

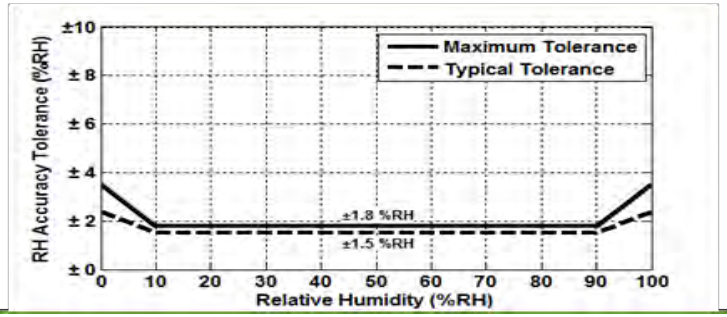
- Silicon-carbide capacitive sensing element
- Excellent stability against aging
- Highly robust protection from harsh environmental conditions and mechanical shock
- Very low power consumption
- Digital I²C Output

Applications

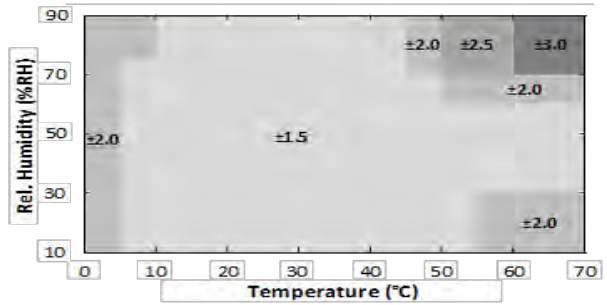
- Climate control systems
- Home appliance
- Weather stations
- Industrial automation
- Process controls and monitoring
- Automotive climate control
- Medical equipment

High RH Accuracy and Long Term Stability You can Depend On

HS3001 Accuracy at 25 ° C



HS3001 Accuracy over Temperature



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FS2012/1012 PRODUCT SNAPSHOT

HIGH PERFORMANCE SOLID-STATE MEMS FLOW SENSOR MODULE FOR LIQUIDS AND GASES

Features

- MEMS Thermopile sensing
- Silicon-carbide coating over MEMS flow sensor
- Low Power, 3V to 5V supply
- Digital and Analog output (FS2012)
- High accuracy (FS2012), 2% of reading (typical)
- Flexible product versions:
  - mV sensor voltage output
  - Fully calibrated and compensated flow for air or liquid

Benefits

- Gas or Liquid flow
- Robust solid isolation technology
- No cavity in MEMS element to cause clogging
- Resistant to vibration and pressure shock
- Food grade compatible version
- Fast response time
- High sensitivity
- Easy cleaning and sterilization

Applications

- Process controls and monitoring
- Oil and Gas leak detection
- HVAC and air control systems
- CPAP and respiratory devices
- Breathalyzer
- Automotive MAF
- Air speed and wind meter
- Liquid dispensing/metering systems
- Medical infusion pumps

Flexible Flow Sensor Solutions with Easy to Use Evaluation Software

FS1012
(mV Output)

FS2012
(Calibrated)

FloDemo Software (FS2012)

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ZMID520X INDUCTIVE POSITION SENSOR AUTOMOTIVE APPLICATIONS

Features

- Contactless inductive position sensing technology
- Analog output (10-bit) or PWM output (10-bit) or SENT output (12-bit)
- Stray field immunity
- 9-point linearization function
- Fully automotive qualified AEC-Q100 (-40 to 150°C)
- Supports ASIL-B standard

Benefits

- Extremely durable, it does not wear out
- Robust and capable for harsh environments
- Lowers BOM (no magnet needed)
- Scalable resolution, high accuracy
- Capable of narrow angles (<30 deg)
- Suitable for safety critical applications
- On- and off-axis system setup

Applications

- Actuator positioning
- Throttle position sensor TPS)
- Steering Angle Sensor (SAS)
- Gas pedal
- Clutch cylinder sensor
- Gear shifter
- Fuel level sensor

Use Case Examples

Rotary 360 Degrees | Small to Long Linear Motion | Small Arc Angle Rotation

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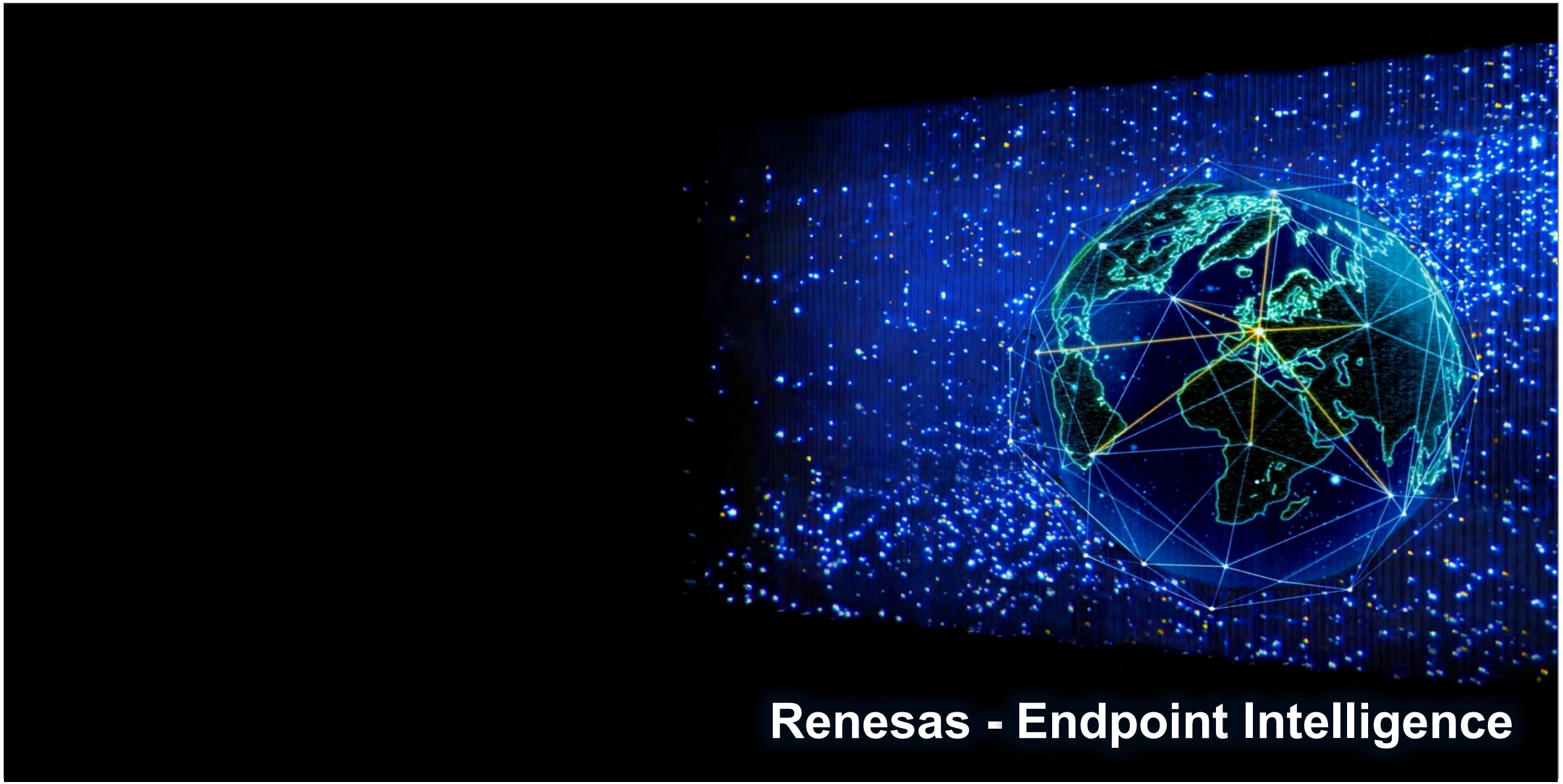

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HOLDER

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