RENESAS INDUSTRIAL BUSINESS OVERVIEW

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SVP, DEPUTY GM INDUSTRIAL BUSINESS UNIT
AGENDA

▪ Corporate Business Overview

▪ Industrial Business
  – Business Status
  – Real-Time embedded Artificial Intelligence (e-AI)
  – Future Spark – Silicon on Thin Buried Oxide (SOTB)

▪ Take Away
CORPORATE OVERVIEW

### Financials Overview* (FY17 1H)

<table>
<thead>
<tr>
<th></th>
<th>B yen</th>
<th>Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Sales</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>Semi Sales</td>
<td>367</td>
<td></td>
</tr>
<tr>
<td>Gross Profit</td>
<td>171</td>
<td>45.6%</td>
</tr>
<tr>
<td>Operating Income</td>
<td>58</td>
<td>15.5%</td>
</tr>
<tr>
<td>EBITDA**</td>
<td>94</td>
<td>24.9%</td>
</tr>
<tr>
<td>Depreciation and Amortization</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Net Income Attributable to Shareholders of Parent Company</td>
<td>61</td>
<td></td>
</tr>
</tbody>
</table>

* Non-GAAP item

**EBITDA: Operating income + depreciation and amortization + amortization of long-term period expenses

### Semi Sales Breakdown by Application*** (FY17 1H)

- **BBU** (Approx. 20%)
- **ABU** (Approx. 50%)
- **IBU** (Approx. 30%)
SEMICONDUCTOR SALES TREND & TARGETS

**Long-term Financial Targets**

- **2x**
  - Served Available Market
  - Growth in Focus Markets
- **50%**
  - Gross Margin
- **>20%**
  - Operating Margin

**FY16/3 Q4 (Jan-Mar16) B Yen**
- BBU: 163.2
- IBU: 49.3
- ABU: 91.9

**FY16/12 Q1 (Apr-Jun16) B Yen**
- BBU: 147.5
- IBU: 45.4
- ABU: 82.5

**FY16/12 Q2 (July-Sep16) B Yen**
- BBU: 148.3
- IBU: 45.1
- ABU: 84.1

**FY16/12 Q3 (Oct-Dec16) B Yen**
- BBU: 161.4
- IBU: 48.2
- ABU: 91.7

**FY17/12 Q1 (Jan-Mar17) B Yen**
- BBU: 172.6
- IBU: 50.6
- ABU: 96.6

**FY17/12 Q2 (Apr-Jun17) B Yen**
- BBU: 194.3
- IBU: 54.0
- ABU: 102.9

() contribution from Intersil acquisition
INVESTMENT FOCUS TO 7 SEGMENTS

<table>
<thead>
<tr>
<th>Segment</th>
<th>Market Size</th>
<th>CAGR FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Infrastructure</td>
<td>5.4 B$</td>
<td>5.9%</td>
</tr>
<tr>
<td>Office Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility Meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Factory</td>
<td>1 B$</td>
<td>10%</td>
</tr>
<tr>
<td>Industry Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smart Home</td>
<td>1.5 B$*</td>
<td>8.6%**</td>
</tr>
<tr>
<td>Home Appliance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthcare</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Served Available Market (SAM)  
** Application CAGR FY15-21  
both estimated by Renesas
EXCELLENT MARKET POSITION

Smart Infrastructure
- **MCU**: Landis+Gyr AG
- **ASSP**: Huawei Technologies Co., Ltd.
- **Electronic Power Meter**: HPL Electric & Power Pvt Ltd.
- **Network Memory**: Itron Inc.
- **Network Memory**: Larsen & Toubro Limited

Smart Factory
- **MCU/SoC/MPU**: Fanuc Corporation
- **Factory Automation**: Midea Group
- **Rockwell Automation, Inc.**: Whirlpool Corporation
- **Siemens AG**: Daikin Industries, Ltd.
- **Yaskawa Electric Corporation**: Haier Inc.

Smart Home
- **MCU**: Midea Group
- **Home Appliances**: Whirlpool Corporation
- **Midea Group**: Daikin Industries, Ltd.
- **Haier Inc.**: Midea Group
- **Whirlpool Corporation**: Haier Inc.
INDUSTRIAL - BUSINESS OUTLOOK

Sustainable Outlook until 2021 in Focus Markets

<table>
<thead>
<tr>
<th>Year</th>
<th>Gross Margin Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY16 (Act)</td>
<td>60%</td>
</tr>
<tr>
<td>FY17 (Est)</td>
<td>60%</td>
</tr>
<tr>
<td>FY21 (Target)</td>
<td>&gt;20%</td>
</tr>
</tbody>
</table>

CAGR 10%
REAL TIME e-AI
EMBEDDED ARTIFICIAL INTELLIGENCE
**RENESAS e-AI – FOCUS ON REAL TIME EMBEDDED SYSTEMS**

**Core competencies in OT**
- Real-time system (efficiency)
- End-point control (reality)
- Safety and robustness
- AI on embedded system
RENESAS e-AI – INference IN OT BY MCU EDGE COMPUTING

Learning in IT

Inference in OT

Neural Network Algorithm

Renesas Translation

Code Size 300 MB

Code Size 300 KB

Learning in IT

Inference in OT

Neural Network Algorithm

Renesas Translation

Code Size 300 MB

Code Size 300 KB

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EXPERIMENT RESULT AT NAKA FACTORY

Abnormality Detection realized by e-AI
- 6x better abnormality detection rate
- Almost no pseudo alarms in factory
- Less maintenance efforts

Effects
- Cost reduction by earlier detection
- Less human interactions
- Significantly increased production efficiency

Normal
- Measured Voltage
- Time

Abnormal
- Measured Voltage
- Time

Increased Production Efficiency
EXPANSION OF E-AI
EXCELLENT MARKET POTENTIAL IN RENESAS’ FOOTPRINT

- Process
  - Abnormality Detection
    - Time series analysis solution
      based on Naka factory PoC

- Vibration
  - Predictive Maintenance
    - Frequency domain analysis
      PoC with global customer

- Inspection
  - Quality Management
    - Image recognition for multivariate analysis

Diagram:
- Semi
- Automotive
- Mechanical
- Food

- Specialized Equipment
  - High-End

- Multi-use Equipment
  - Middle to Low-end

- Growth Area
- # of factory
OFFLOAD ENGINE DRP - FOR REAL TIME EDGE COMPUTING
EXECUTING e-AI WITH HIGH SPEED AT LOW POWER

DRP*: Key Differentiator
Introduce e-AI into embedded world

- 10x Faster than GPU
- 100x Faster than CPU

Real Time Edge Computing on MCU at Low Power

*DRP; Dynamically Reconfigurable Processor
EXPANSION OF ECOSYSTEM TOWARDS OPEN e-AI PLATFORM

- Top share footprint
- Embedded-AI solution
- AI secure update solution
- e-AI Service Platform

Customer & Partner Platform
DRIVE SMART SOCIETY
AND CREATE NEW MARKETS

- Learning platform
- Pre Processing
- Data analytics
- Neuro-network support
- Development environment
- Software IP
- Board, Tool
- Sler
- Embedded system

NEW DRP
FUTURE SPARK – SOTB
SILICON ON THIN BURIED OXIDE
FUTURE SPARK – SOTB

Standby Current (µA)

- 10
- 1
- 0.1

Active Current (µA/MHz)

- 28nm FDSOI
- 90~40nm
- 130~90nm

Conventional Battery System (>200µA)

Long Battery Life

Conventional MCU

90~40nm

130~90nm

FDSoI

Target of SOTB

ULP Bench Score

Active Current (µA/MHz)
**FUTURE SPARK – SOTB**

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**Disruptive Ultra Low Power Performance of SOTB**

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**Conventional Circuit**

- Power supply = Battery
- Normal MCU

**SOTB**

- Battery-free
- Operated by Environment Power

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- Light (Solar)
- Temperature
- Vibration
- Water flow
- Wind
- ...

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**SOTB realizes**

- Operating Current \( \times 0.1 \)
- Standby Current \( \times 0.01 \)
SOTB – A TECHNOLOGY WHICH CAN CHANGE OUR LIFE

Realize Battery-less system with Energy Harvesting Solution

Maintenance free device enables Autonomous World

- Wind
- Water flow
- Pressure
- Vibration
- Light
- Solar
- ΔTemp.
TAKE AWAY

- Strong Industrial Customer Footprint
- Sustainable high profit growth
- Real Time e-AI As future growth driver
- SOTB Can change our life
Renesas creates leading semiconductor solutions that spark innovation for a connected world, building a trusted brand we can be proud of.