

Business Presentation for Electronic Materials (EM) Business

March 15, 2017

FORWARD-LOOKING STATEMENTS

Forward-looking statements, such as those relating to earnings forecasts and other projections contained in this material, are management's current assumptions and beliefs based on currently available information. Such forward-looking statements are subject to a number of risks, uncertainties, and other factors. Accordingly, actual results may differ materially from those projected due to various factors.

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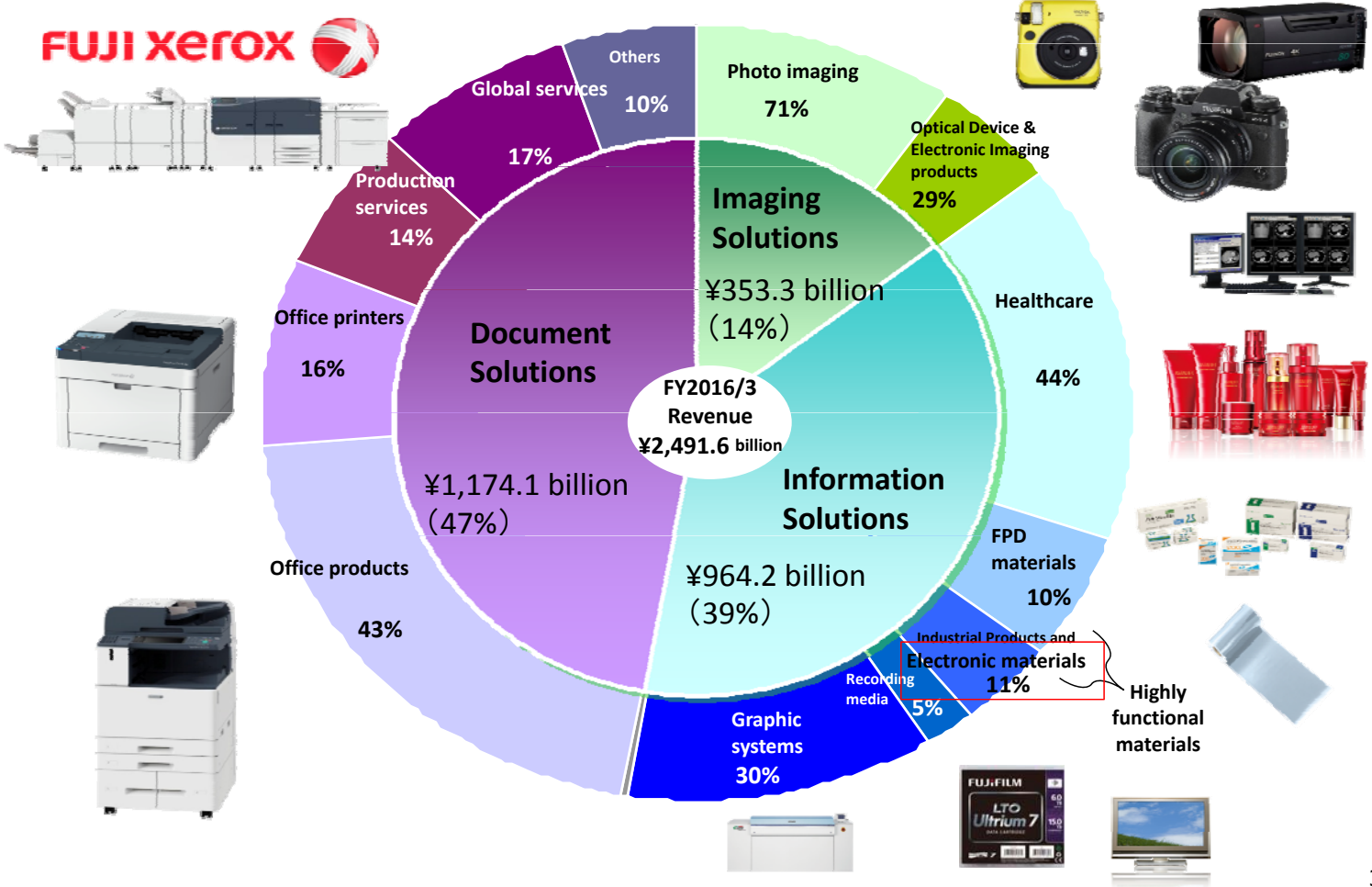
Today's Agenda

Business Structure

Strength of EM business

Growth Strategies

Business Structure



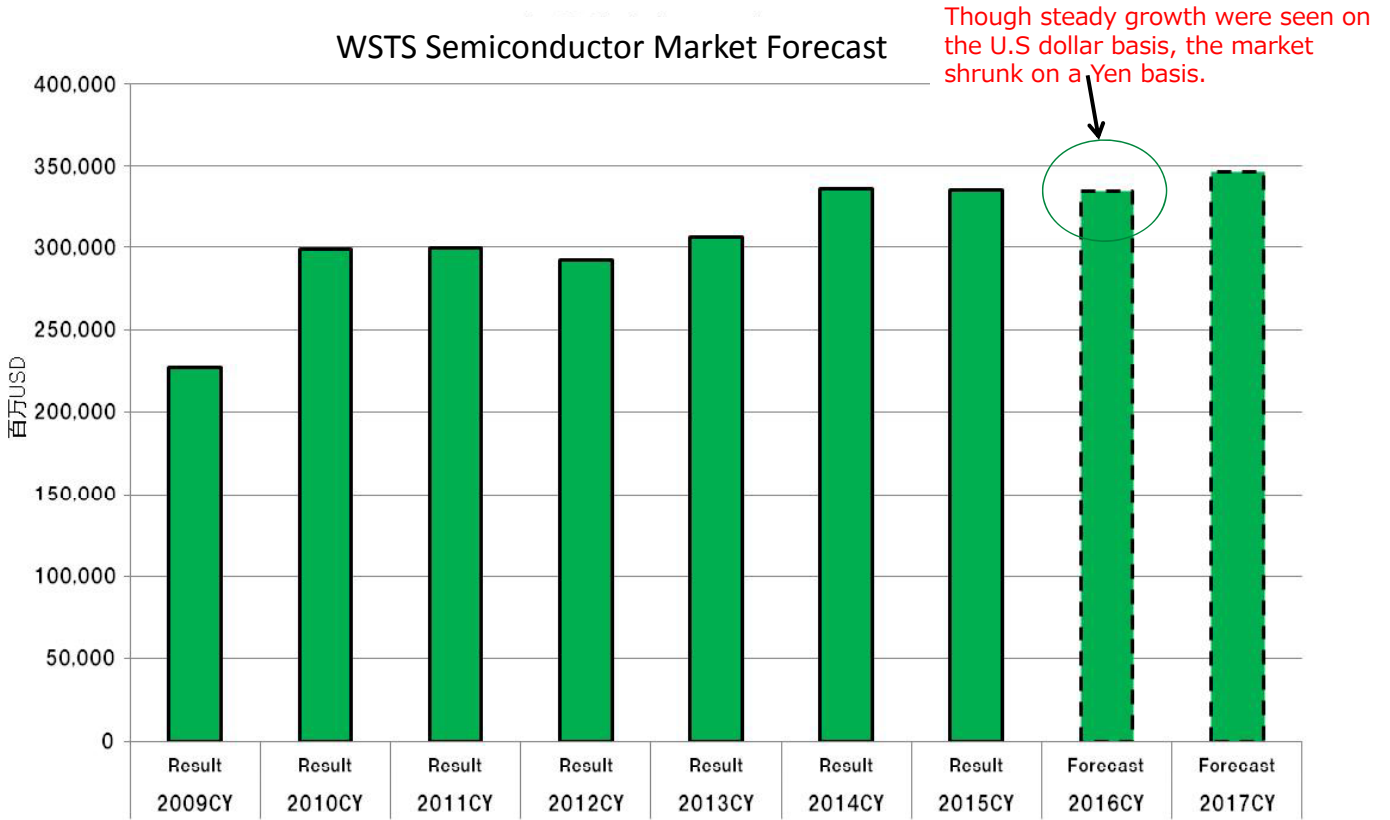
Business Structure

There are 9 plants in the world. Most products were manufactured by several plants.



 ...Plants which were reinforced or built over the last 3 years

Recent changes of the market – Semiconductor market has grown steadily



Recent changes in the market – Slowdown in growth of smartphones and IoT devices

Slowdown in growth of smartphones

Smartphone market maturing, market growth has slowed

CY2015 Growth rate
YoY: +11.1%



CY2016 Growth rate
YoY: +3.2%

Delay in the rise of the IoT Device market

Delay in the rise of the electronic materials market for IoT devices



Downward revision of growth forecasts

Many legacy materials will be used in semiconductors for IoT, instead of cutting-edge devices because they will be manufactured using existing devices at least 28nm (Poly-Si) nodes.

Recent changes of the market – More Moore and More than Moore

More Moore

Movement for **miniaturization**

ArF Double patterning/
Multi patterning

Demands for cost reduction
increase due to increasing
number of masks

ArF Double patterning/
Multi patterning



EUV

More Than Moore

miniaturization → High functionality

3D NAND

highly-integrated, large
capacity, FlashMemory

Implementing increase
of demands for SSD

3D DRAM

High-Band

Implementing HBM (High
Bandwidth Memory)

2.5D, 3D chips

Using RDL, FOWLP

Advancing FOWLP by Logic
Foundry: TSMC InFO

highly-integrated,
large capacity

Image Sensor
with DRAM

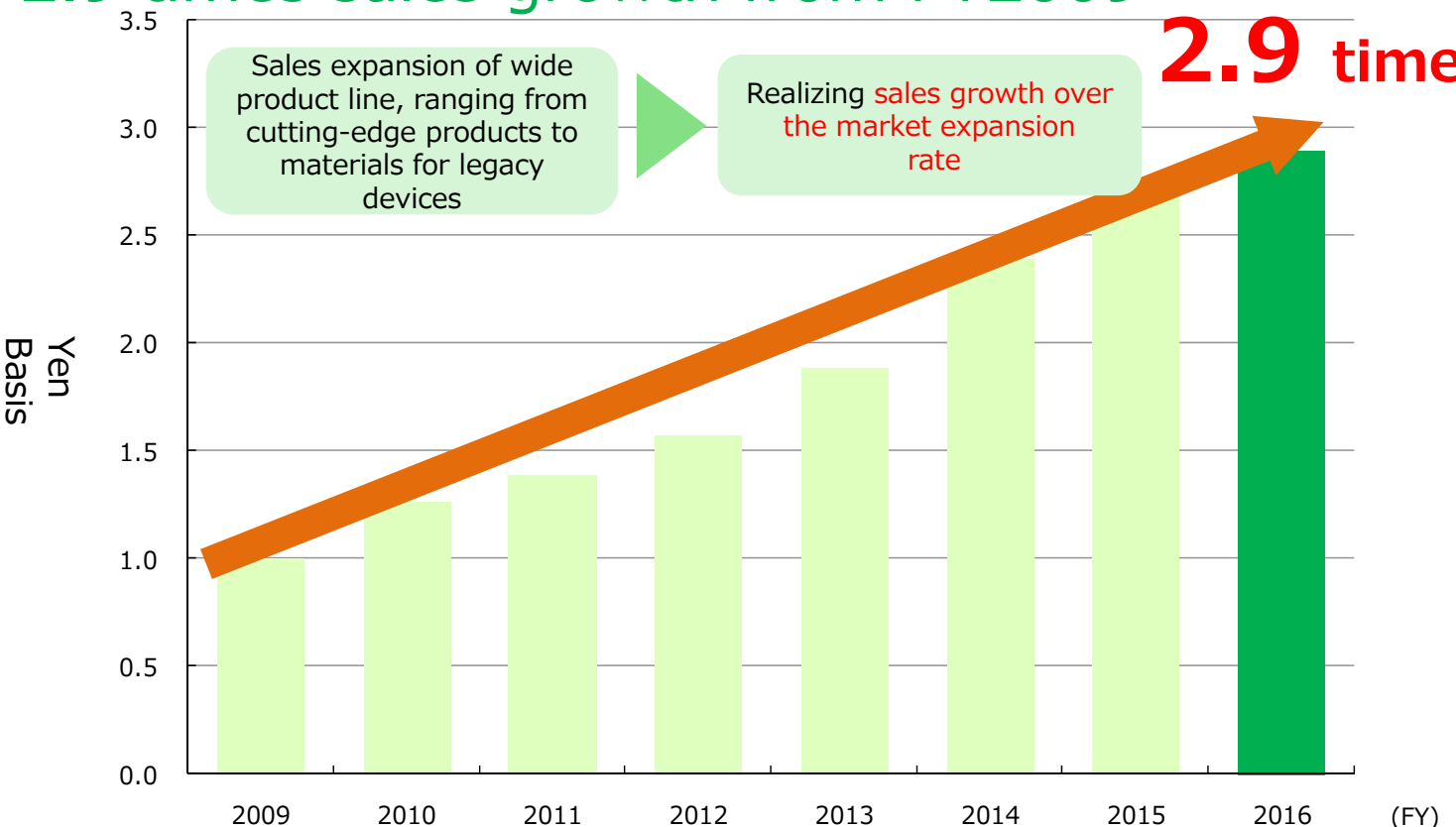
Implementing High pixel,
High speed flaming

IoT, Automatic driving

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2.9 times sales growth from FY2009

2.9 times



Growth of the EM business

Gaining customer trust through differentiation from competitors

1) Development of advanced highly functional products

- **Fundamental technologies:** Capability to design and synthesize organic chemical compounds/polymers and to identify and analyze phenomena.
- **Product development:** Capability to design/develop with speed and accuracy based on customer needs identified through on-site sales.

2) Stable supply of leading-edge products

- **Stable and consistent manufacturing** (control performance of raw materials/management of manufacturing process)
- **Quality Assurance (QA)/Quality Control (QC)**
 - 1: Our plants: Taking action against change in daily performance, responding to prevent abnormal data and human error
 - 2: Production lines at customer plants: Reacting promptly and accurately when problems occur

3) Wide range of leading-edge, high-value-added global products that meet customers' needs

- Selling **wide range of product lines**, such as photoresists including ArF resists, photolithography-related materials, COLOR MOSAIC for Image Sensors (ISCM), CMP slurries, cleaners/etchants, thin films, polyimide and high-purity solvents to semiconductor manufacturers around the world.

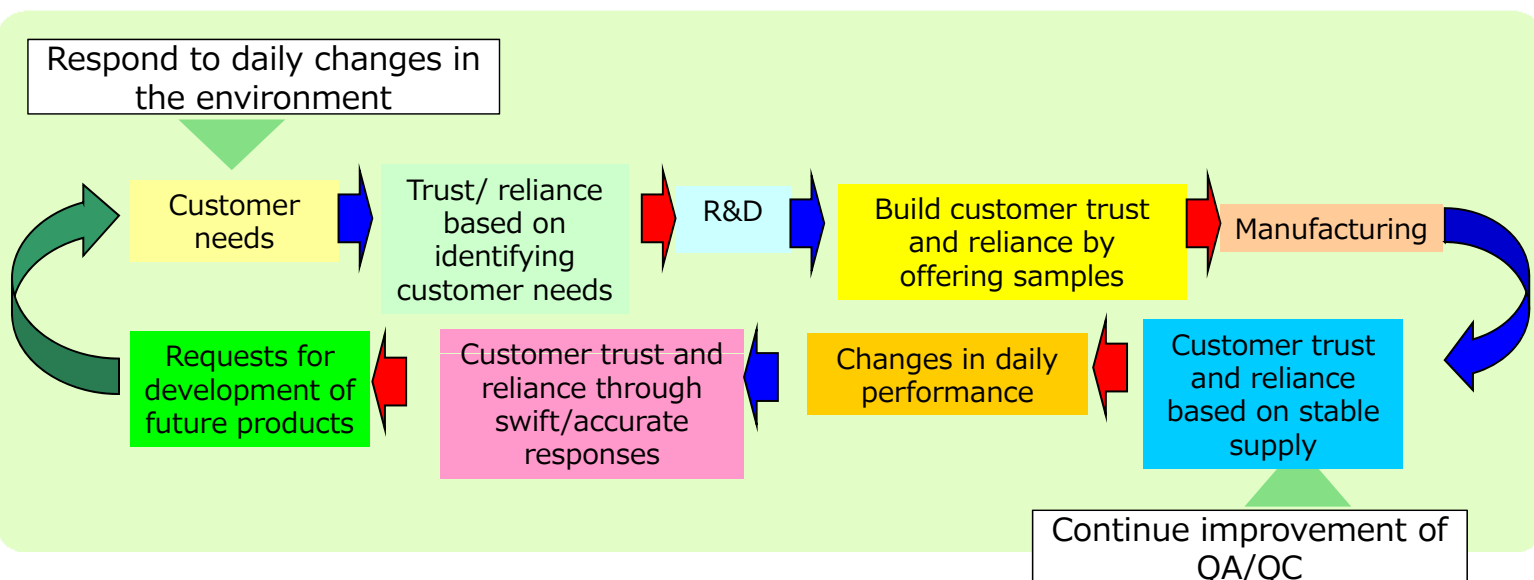
4) Global production and supply system and integrated development system

- Regarding FFEM Shizuoka factory as a mother factory, placing production bases in the U.S., Europe, and Asia. Aiming for stable supply to customers and **sharing information including product development between each base** by **setting up several product supply bases for each product**.
- Managing each base of FFEM (Japan, Europe, U.S., Taiwan, Korea, Singapore, and China) in the same direction -> Supporting Chinese market where volume is expanding.

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Building win-win relationships with priority customers (to gain and hold customer trust and reliance)

- Thorough awareness of Incident Free (No HVM (High Volume Manufacturing issue)) operations regarding QA/QC for members including top management, R&D, production, and sales. Support from the whole company to provide customer assistance. Creating win-win relationships with priority customers, following the management cycle shown below.



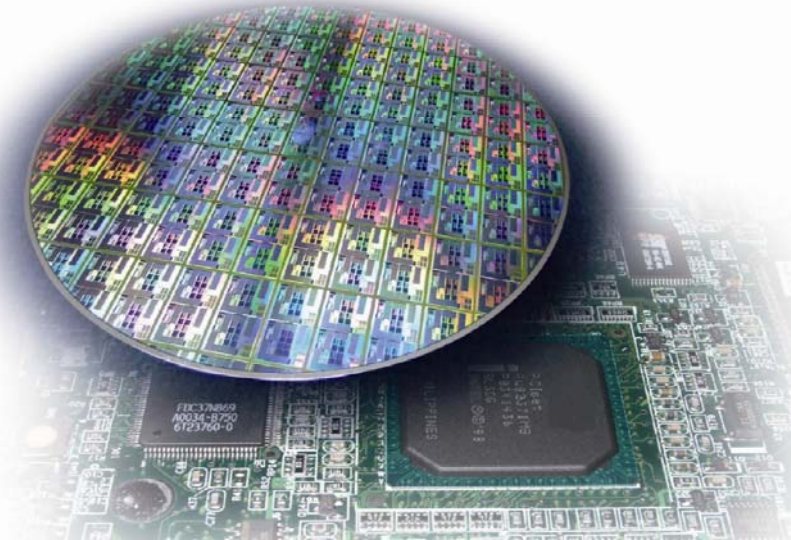
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Growth Strategies

1. Develop highly functional materials in a wide field using advanced technology developments
2. Contribute to the development of the semiconductor industry through building win-win relationships with customers

Main Products for Growth

- ① Photoresists
 - ② ISCM
 - ③ CMP slurries
 - ④ Photolithography related materials
- ① Etchants/Cleaners
 - ② Polyimide



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Growth Strategies-(1) Photoresists, (4) Photolithography-Related Materials

From ArF immersion resists to photolithography-related materials

- Specialize in the development of advanced photoresists and expand business in ArF immersion/top coat less (TCL) photoresists and photoresists for NTI
- Expand business areas from photoresists to NTI developers and other photolithographic-related materials
- For extreme ultraviolet (EUV) resists, develop materials together with customers that meet customer needs

Advantages of the Business

- Selling Fujifilm's original NTI developing liquids and resists that are highly competitive especially in cutting-edge products
- Utilizing technologies that realize high quality, stable supply, and high volume manufacturing (analysis technologies, synthesis technologies)

Future Measures

Promote development of EUV resists

At present, ArF immersion and multi-patterning are expanding start-up of EUV processes has been delayed ⇒Expand EB sales through increase in usage volume of photomasks

- Only ArF to →
 - Strengthening of EB** (increase in number of masks): Expansion in opportunities for EB resists business where Fujifilm has a high market share
 - Expand ArF business (ArF resists for NTI)
 - KrF (thick membranes) and pre-wet agents

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Expand Business by Maintaining Leading Market Position

- Achieve leading market share (over 80%) by launching products ahead of competitors
- Increase RGB by transitioning to dual cameras in advanced smartphones
- Expand business for in-vehicle business (automatic driving) and security use (facial recognition, iris recognition) with infrared region (IR) products

Advantages of the Business

Draw on technologies developed in the photoresist field, including **micro-photopolymer technologies, wavelength control technologies, and technologies for distributing ultra-fine pigment dyes evenly.**

Future Measures

Aim to maintain high market share of RGB and develop/introduce new materials for new applications. Aim to take leading market share in new materials.

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Provide leading-edge CMP slurries for Cu and barriers

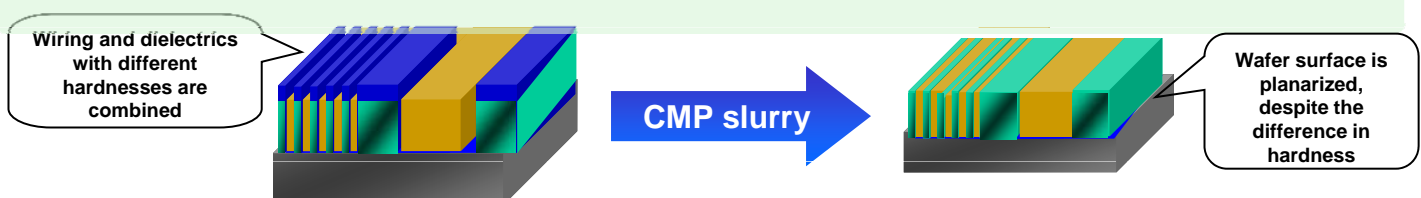
- Specialize in sales/development of **leading-edge CMP slurries for Cu and barriers (Ba)**
- Expanding business for **CMP slurries for Co/Ba** from CMP slurries which only use for Cu/ Ba

Advantages of the Business

- Leading-edge technologies for CMP slurries, including cost-competitiveness and sales capabilities
- The ability to react for needs** from each customer

Future Measures

- Reinforce measures to **react to customers' needs and improve transport efficiency** by used manufacturing sites in South Korea and Taiwan
- Expanding **business for Front –end**



Equally/Smoothly planarize wafer surface that has a mixture of various substances with different hardnesses

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Offer advanced materials that meet the progress of technologies

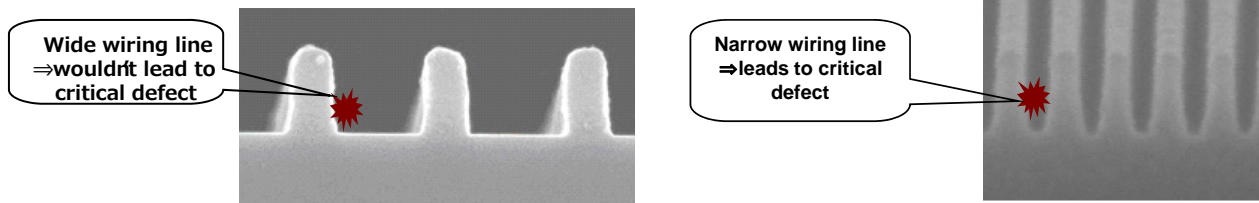
Advantages of the Business

- Build relationships with major semiconductor manufacturing companies and offer materials that meet the needs of the customers' operations

Future Measures

- Promptly establish and introduce materials development/process capabilities that meet the daily development of circuit patterning through cooperation with customers
- Expanding sales of Cleaners for process of Co wiring

As miniaturization proceeds, removing contaminants (the resin, metal, and other materials remaining after the wiring process that leads to defects) and further improving accuracy are becoming more and more necessary.



Contaminants with the same size will become a critical problem as miniaturization proceeds.

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Introduce Products Aimed at the Expanding Mid-End Markets

Back grounds

- Because of the limitations on DRAM and logic miniaturization, **3D/2.5D semiconductors with circuit rearrangement** are expected to realize higher speeds, expand transmission volumes, lower costs, and achieve other objectives.
- Emergence of new mid-end markets (OSAT)**. Entry from a prior process stage => **Expected to expand market** for materials for this field.

Advantages of the Business

- In comparison with competitors, Fujifilm has strengths in photosensitive technologies and technologies for photo base generating agents and thermal base generating agents using **low temperature cure polyimides (LTC PI)**.

Future Measures

- First, introduce to existing customers, then expand to Big Followers in Asia.

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Accelerate growth by leveraging acquisition

- 2004** FFEM became a 100%-owned subsidiary of FF while FF purchased the major part of the Microelectronic Materials Div. of Arch Chemicals (a manufacturing base in Europe/U.S.A. and a sales base in Europe/the U.S.A./Asia)
- 2005** FF established the Electronic Materials Div.
Purchased 50 shares of Planar Solutions, a manufacturing/sales company of CMP slurries, from Arch Chemicals.
- 2010** Made Planar Solutions into a 100%-owned subsidiary.
- 2015** Acquired Ultra Pure Solutions, Inc., high-purity solvent manufacturer in the U.S.
- 2016** Announced the acquisition of Wako Pure Chemical Industries, Ltd.

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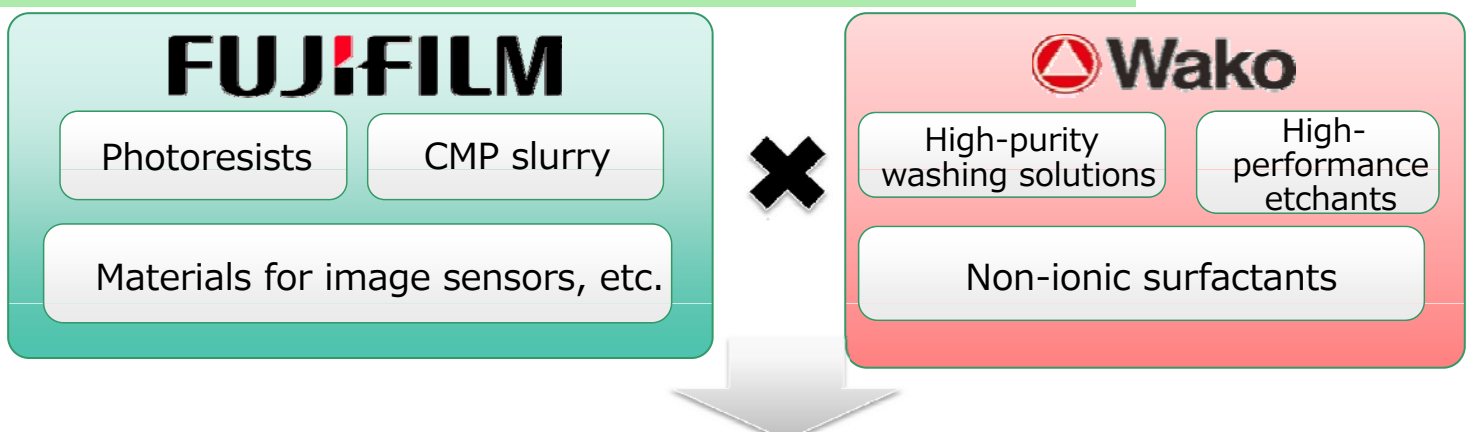
Ultra Pure Solutions, Inc (FEUP)

Expand sales of ultra-pure organic solvents to FFEM customers and increase sales of FFEM products to major customers of FEUP

As a result of the acquisition, FEUP has adopted FFEM's quality assurance and quality control (QA/QC) systems, and synergistic effects have already emerged, as evidenced by receipt of awards from customers.

In April 2016, received **Superior Supplier Award from leading semiconductor manufacturer**

Wako Pure Chemical Industries, Ltd.

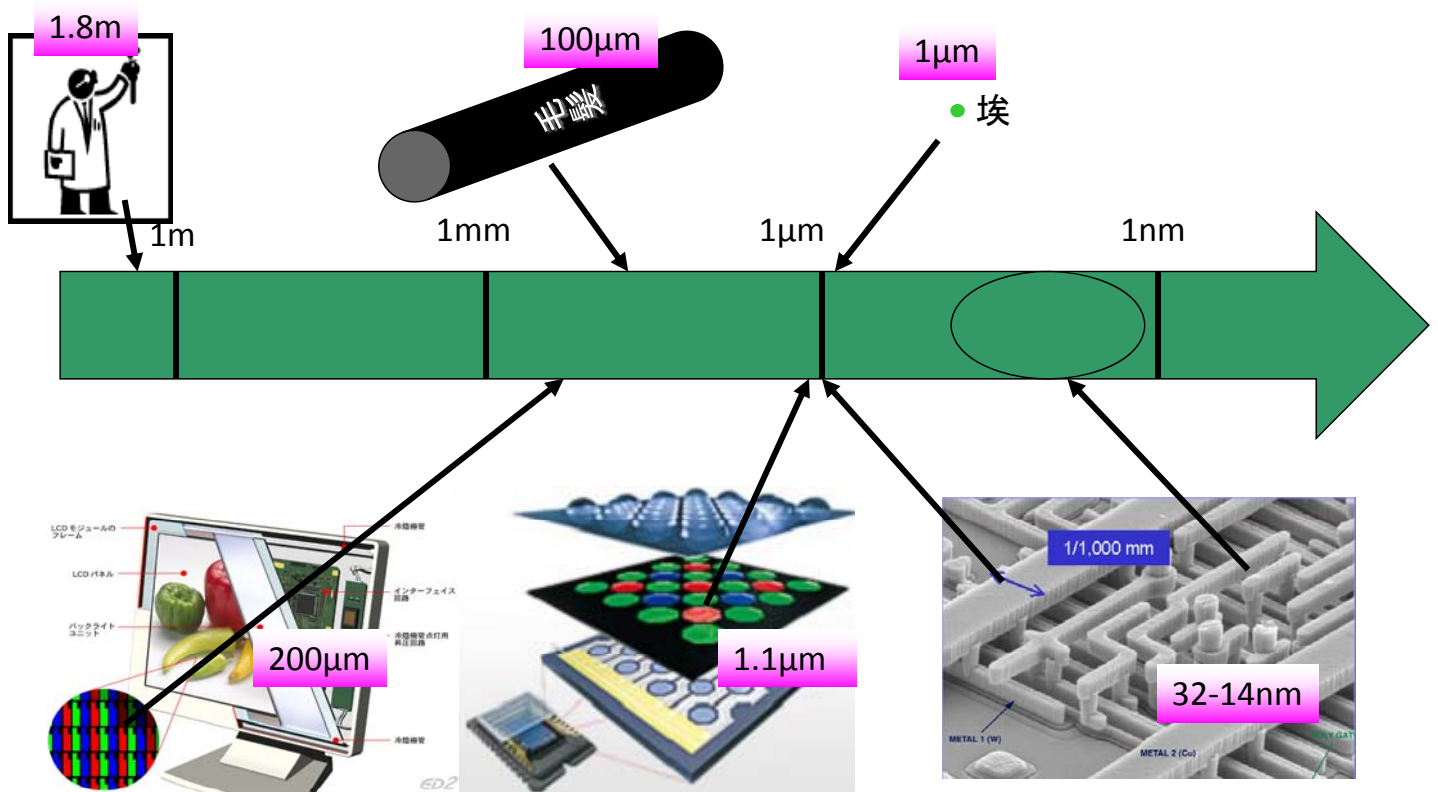
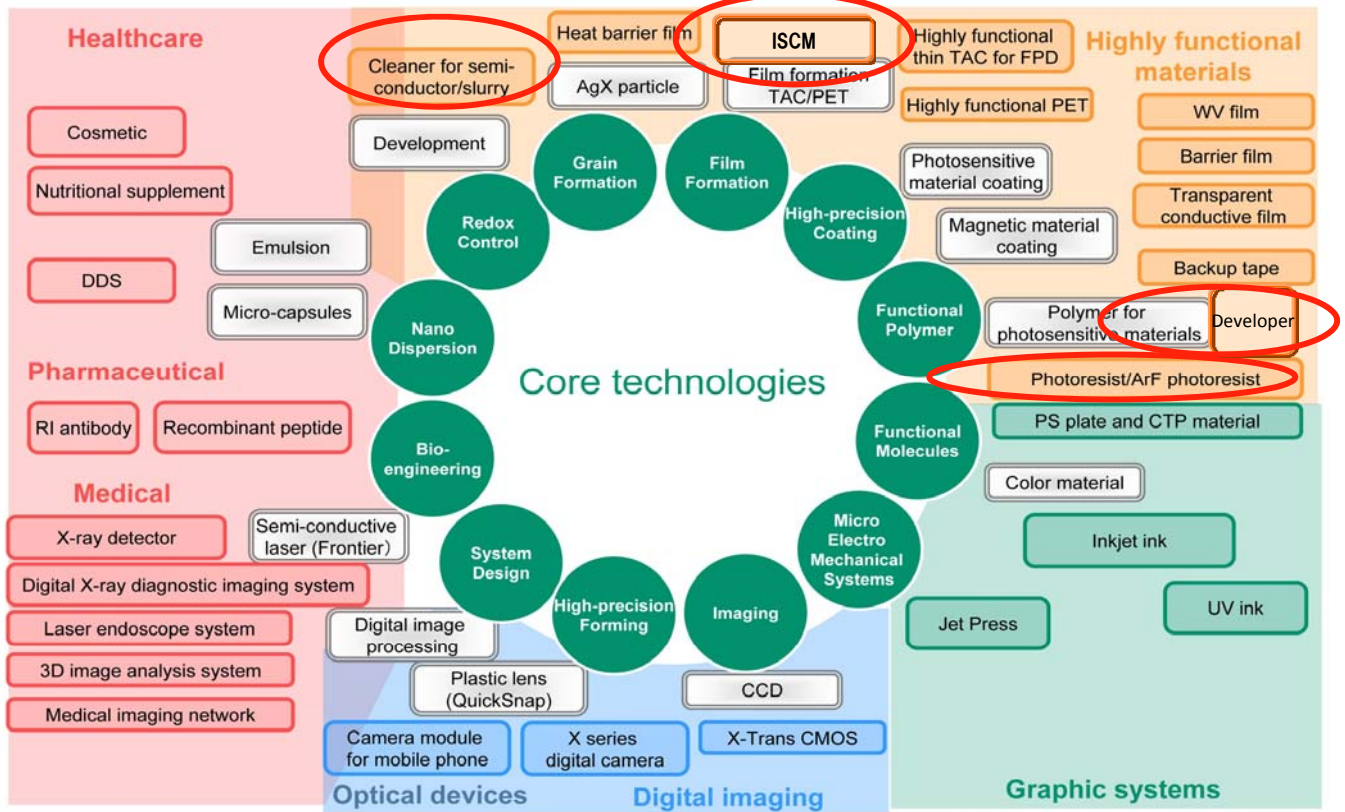


Growth of the Electronics Materials Business

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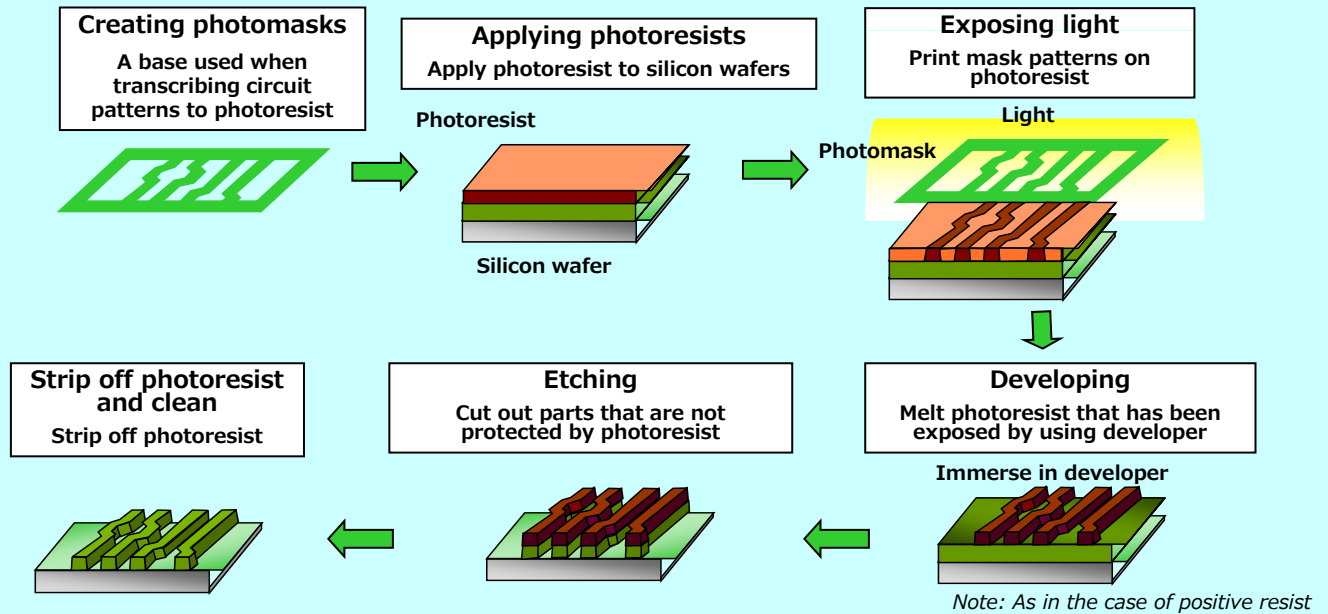
- (1) Maintain extremely high growth rate in the industry
- (2) Seize opportunities firmly in a changing market environment
- (3) Use Fujifilm's strengths in each of development, production, and sales/marketing to maximize advantage
- (4) Plan to increase sales in each of a wide range of products
- (5) Leverage M&A for further business expansion

A field where Fujifilm's **technological** strengths can be utilized = **semiconductor materials**



Photoresists are indispensable for the manufacturing of ultrasmall circuit patterns. This photopolymer is used in the microphotolithography process, where the circuit pattern is printed onto a silicon wafer via exposure to light.

Pattern formation by lithography technology



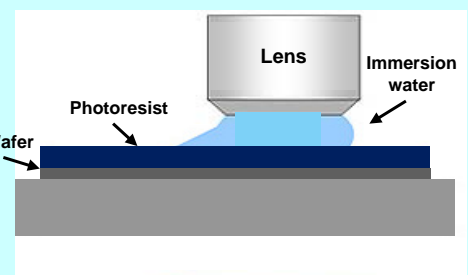
New technologies are used to meet the needs for the further miniaturization of circuit dimension.

ArF immersion

A technology for increasing the resolution by filling the space between the stepper lens and the wafer with water that has a higher refractive index than air. This makes possible micro-processing without changing the light source or the photomask.

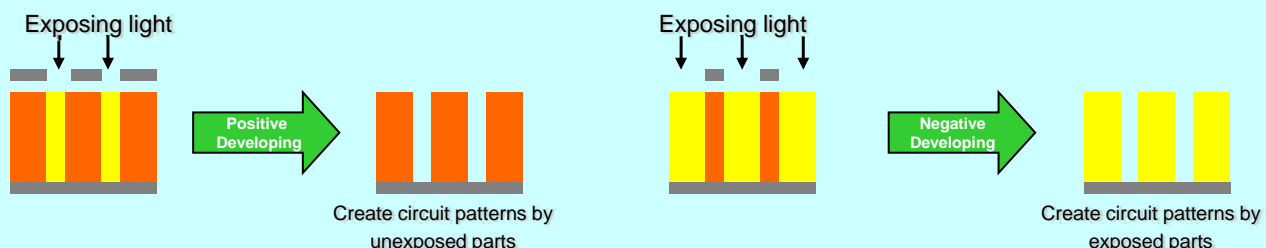
Top coat less

In the case of immersion, a topcoat is necessary to prevent elution into the water contained in the resist. With "top coat less" technology, the need for a topcoat is eliminated at the time of the exposure because polarity conversion technology changes the hydrophobic resist surface to a hydrophilic surface when development takes place.



Negative tone imaging (NTI)

Uses negative developing, a system that the exposed part is left. It realizes further miniaturization compared with the positive developing system, while shorting tact-time through its high sensitiveness.



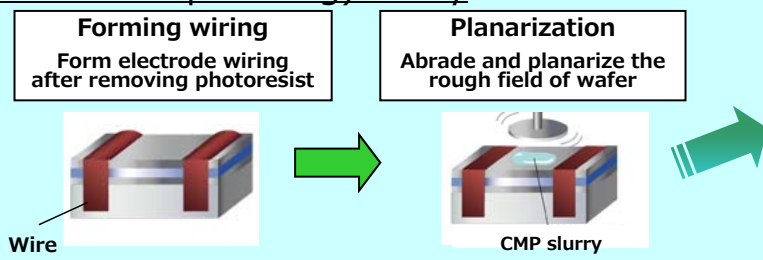
Color resists

A photo-sensitized coloring material to manufacture micro color filters, used in image sensors



CMP (chemical mechanical polishing) slurry

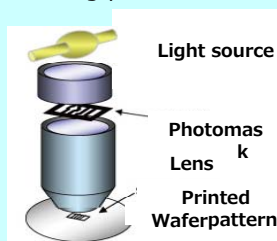
An abrasive material used to planarize the substrate that has various materials in the circuit structure, like metal or dielectrics, to the ultimate level



CMP process

Photoresist products for photomask fabrication

A specialized resist used for manufacturing photomasks



Cleaner

A cleaner used for clearing substrates and removing impurities. It is used several times during the process of manufacturing semiconductors.



Products for thin film deposition

Insulator materials providing a low dielectric (Low-k). It prevents reduction of the device operation speed or an increase in the power consumption, caused by the reduction in the size of the wiring line and the insulator in between the lines.

Polyimide Products

Polyimides are widely used as an electronic material in various applications. They have such characteristics as high thermal durability and good insulation properties.