

FY2015 Medium-Term Management Plan

Power Semiconductors Business

August 26, 2013

Fuji Electric Co., Ltd.

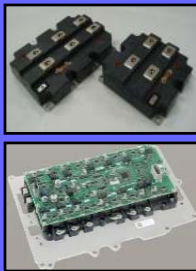



Electronic Devices Business Group

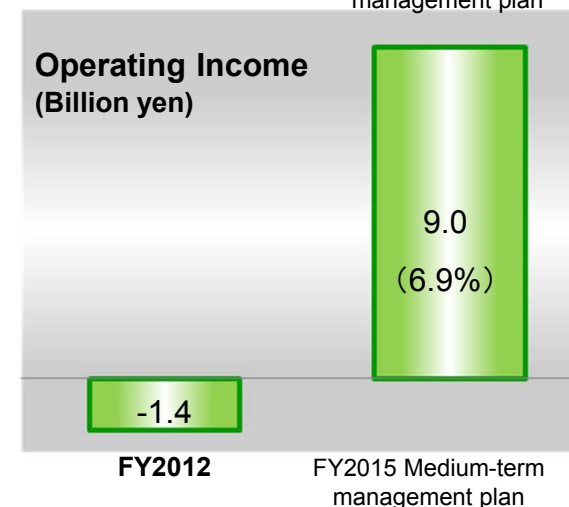
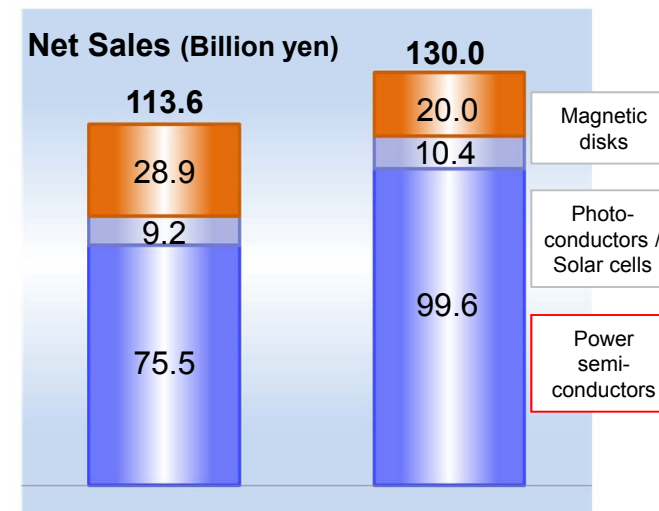
- Business Overview
- Market Trends / Business Targets
- Business Strategies / Priority Measures
- R&D Expenditures / Plant and Equipment Investment

Business Overview

Electronic Devices Segment

Realize operating income margin of 7% in FY2015

Subsegments	Major products	Application
Semi-conductors	Power semiconductors 	Inverters PCs Air conditioners Automobiles Power supplies
	Photoconductors 	Copiers Printers
	Solar cells 	Solar power generation
Magnetic disks	Aluminum substrate magnetic disks Glass substrate magnetic disks 	HDDs



Power Semiconductors Overview

(FY2012)

Application

Products

Characteristics

**Industrial field
(45% of total sales)**



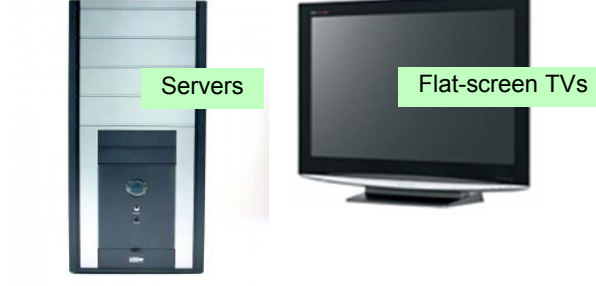
Inverters, NC machine tools, elevators, UPSs, PCss (wind / solar power generation), air conditioners, etc.

**Automotive field
(35% of total sales)**



Engine controls, transmission controls, brake controls, steering controls, HEV motor controls, etc.

**Power supply field
(20% of total sales)**



Industrial equipment, information equipment, communications, servers, PCs, flat-screen TVs, video game consoles, copiers, printers, etc.

IGBT modules

SiC modules

RB-IGBT modules

Automotive IGBT IPMs

Discrete products

Pressure sensors

Power ICs

Igniters

Discrete products

Power supply control ICs

Power MOSFETs

Diodes

Unique devices that greatly improve power conversion efficiency (SiC, RB-IGBT) and packaging technologies that realize high reliability

Small, light-weight, and reliable devices critical for driving, turning, and stopping created by utilizing unique technologies (direct water cooling technology, single chip power IC technology)

High-voltage, low-loss power supply IC and SJ-MOS*1 technologies that respond to ever stricter energy saving standards for power supplies

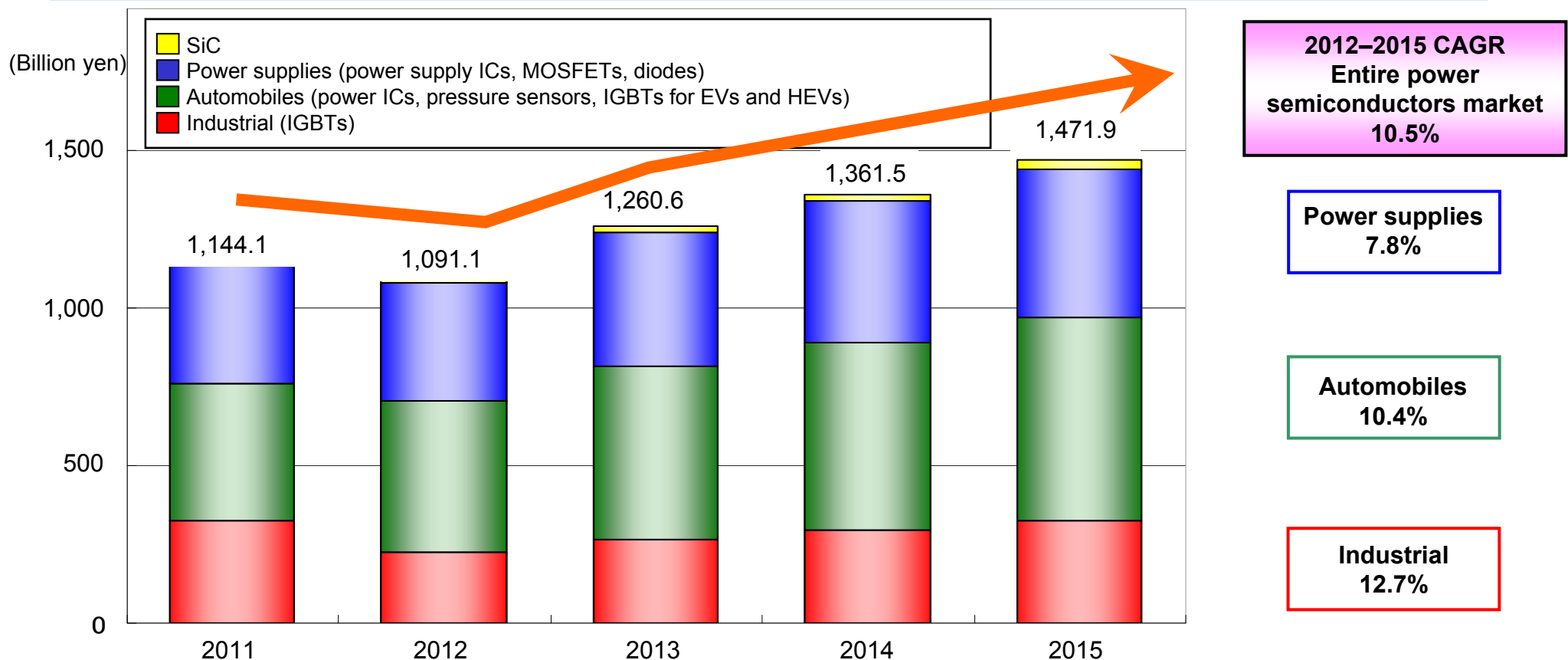
*1) SJ-MOS ; Superjunction MOSFET

Market Trends / Business Targets

Power Semiconductors Market Trends

(Market in which Fuji Electric Participates)

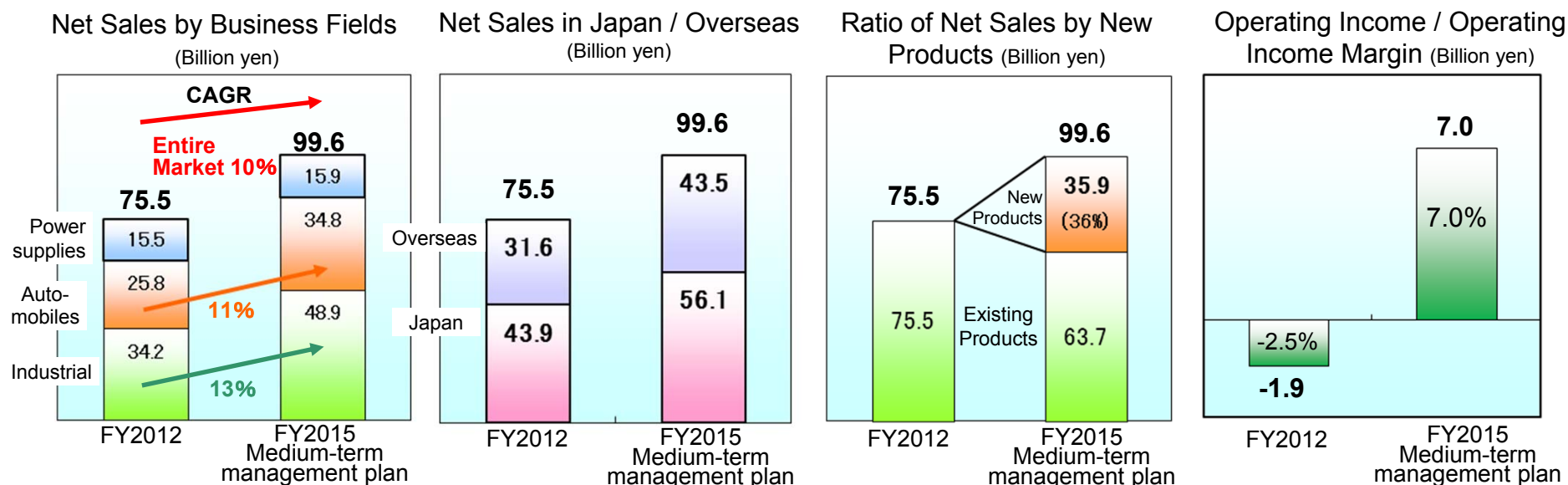
- Market contraction in FY2012, average growth rate of 10% projected for FY2013 onward
- Expansion in domestic markets for EVs, HEVs, and industrial equipment and overseas markets for industrial equipment, consumer electronics, new energy, and eco-friendly vehicles



Projections by Fuji Electric based on market data from IHS and other sources

Basic Policies

- Shift management focus from sales expansion to profitability
- Strengthen business resilience to changes in market conditions
(selectively enhance benefits of business restructuring measures instituted in FY2012)
- Expand sales in new energy, energy savings, and environmental markets centered on industrial and automotive IGBTs
- Strengthen development capabilities and create new products to win out against global competition



Business Strategies / Priority Measures

Business Strategies

- Develop new products for new energy, energy-saving, and environmental markets
- Optimize global operations and improve cost competitiveness

Priority Measures

- **Accelerate development of new products for new energy, energy-saving, and environmental markets**
 - Develop IGBTs for new energy, industrial equipment, consumer electronics, and EVs and HEVs
 - Develop products for the energy-saving power supply market
 - Develop and commence production of 6-inch SiC devices (October 2013)
- **Optimize global operations**
 - Increase overseas sales through local design (Europe, Taiwan, China) and local production for local consumption
 - Pursue cost reductions
 - Expand overseas production (overseas production ratio 35% → 60%)
 - Step up overseas parts procurement (overseas procurement ratio 31% → 60%)
- **Commence operations and expand production of new strategic bases**
 - Start up 8-inch front-end-process production line in Yamanashi Factory (October 2013)
 - Expand portion of production for Fuji Electric's products at Tsugaru Factory
 - Establish back-end process system to increase production in Shenzhen, China

Market Trends

■ Rise in supply of clean energy

- Expanded use of wind power, solar power, and other forms of new energy



■ Energy saving, automation, and stabilization of power supplies

- Rise in energy efficient equipment
- Expanded use of inverters



Fuji Electric's Initiatives:

Create series of new products that realize high power conversion efficiency

★ Develop new products compatible with high capacity and high power conversion efficiency



◆ High power modules

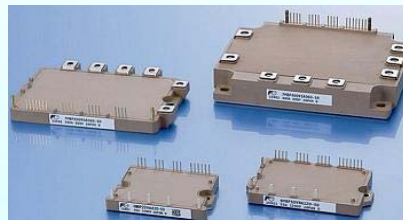


◆ SiC modules



◆ RB-IGBT modules (new 3-level)

★ Develop products with the necessary functions to support various applications (V-Series chips, protective circuits, rectification circuits, etc.)



◆ IPMs*2



◆ Small IPMs*2



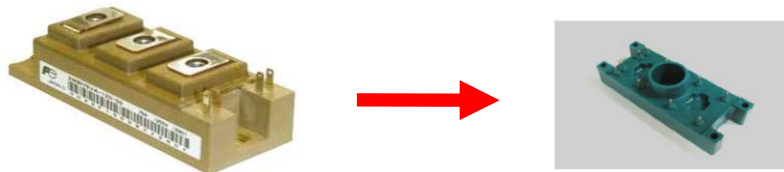
◆ PIMs*3

*2) IPM; Intelligent Power Module *3) PIM; Power Integrated Module

New Products Compatible with High Capacity and High Power Conversion Efficiency

■ SiC modules (6 inch)

Low-loss / Small size



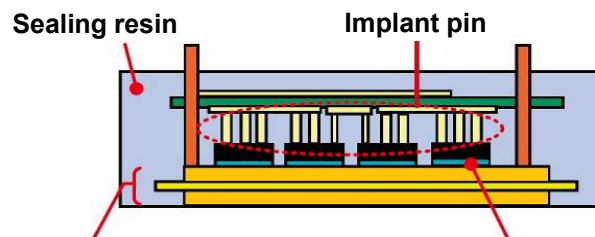
◆ Si-IGBT modules

◆ SiC modules

Compared with Si-IGBT modules (1200V/100A/2in1)

- Loss: -60 to -80%
- Area: -50% (footprint)
- Volume: -80%

New structured package



Thick Cu plate DCB substrate

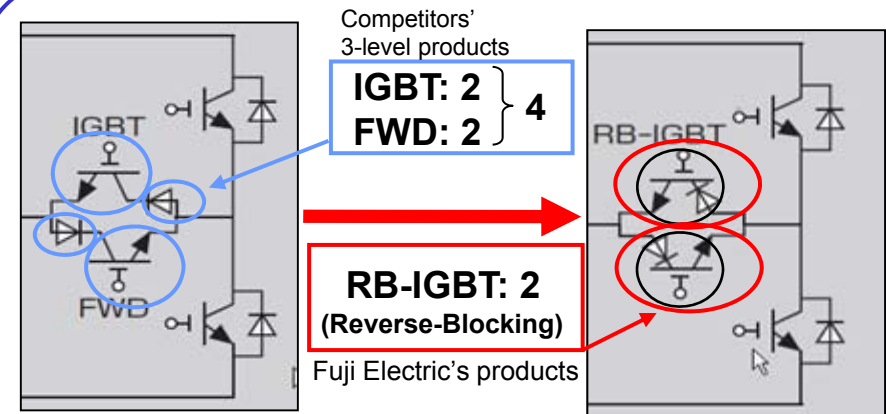
Solder / metal particles

● Back-end processes

→ Install automated assembly line in Matsumoto Factory

■ RB-IGBT modules (new 3-level)

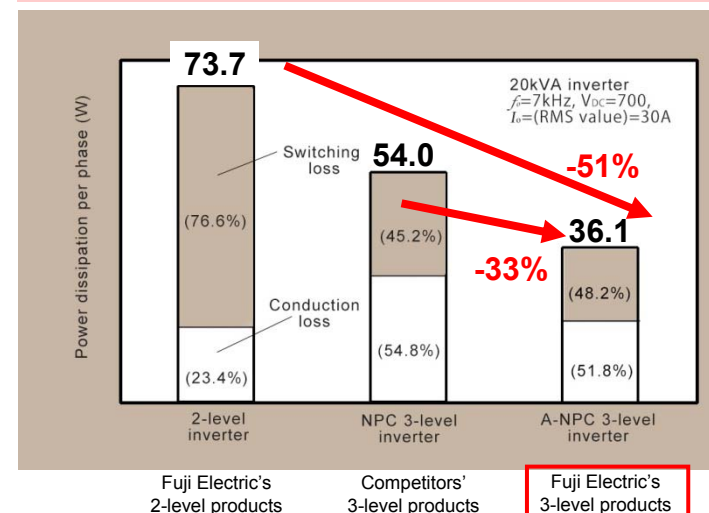
Halved elements (4 → 2)



◆ IGBT/FWD structure

◆ RB-IGBT structure

Halved loss

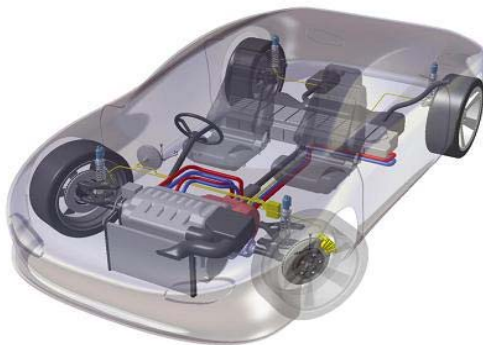


- Market Trends and Fuji Electric's Initiatives

Market Trends

- Regulation of exhaust gas (European emission standards, CO₂ emission standards, etc.)
- Increased incentives for eco-friendly vehicle purchasing

- Spread of EVs and HEVs
- Improvement of fuel efficiency and reduction of exhaust



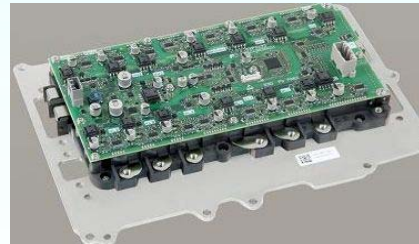
Efforts to improve safety

- Safe driving

Fuji Electric's Initiatives:

Develop small, light-weight, reliable products using unique technologies (direct water cooling technology, single chip power IC technology)

★ Realize high current density by utilizing direct water cooling technology



◆ IPMs for PHEVs

★ Develop single chip products that comply with stricter environmental and fuel regulations

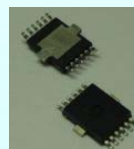


◆ Pressure sensors



◆ Igniters

★ Develop high current density products for driver safety systems (equipped with more electrical components)



◆ Power ICs, IPDs*4

*4) IPD; Intelligent Power Device

Power Supply Field

- Market Trends and Fuji Electric's Initiatives

Market Trends

■ Need to respond to stricter standards for power supplies

Regulation of power conversion efficiency and harmonics
(Energy Star, 80PLUS, etc.)

- Increased demand for high-efficiency power supplies for data center servers



■ Stronger drive toward energy savings

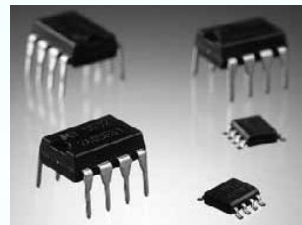
- Spread of energy-saving consumer electronics and lighting
Increased demand for specialized circuits for power supplies



Fuji Electric's Initiatives:

Create series of new products that realize energy savings by utilizing unique high-voltage, low-loss device technologies

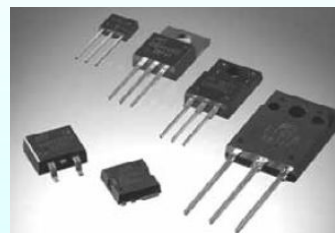
★ Control ICs compatible with power supply standards



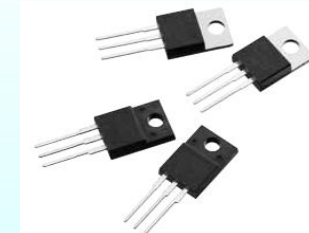
◆ Power supply control ICs for realizing high power conversion efficiency

◆ Power factor control ICs

★ High-voltage, low-loss discrete devices for power supplies



◆ SJ-MOSFETs

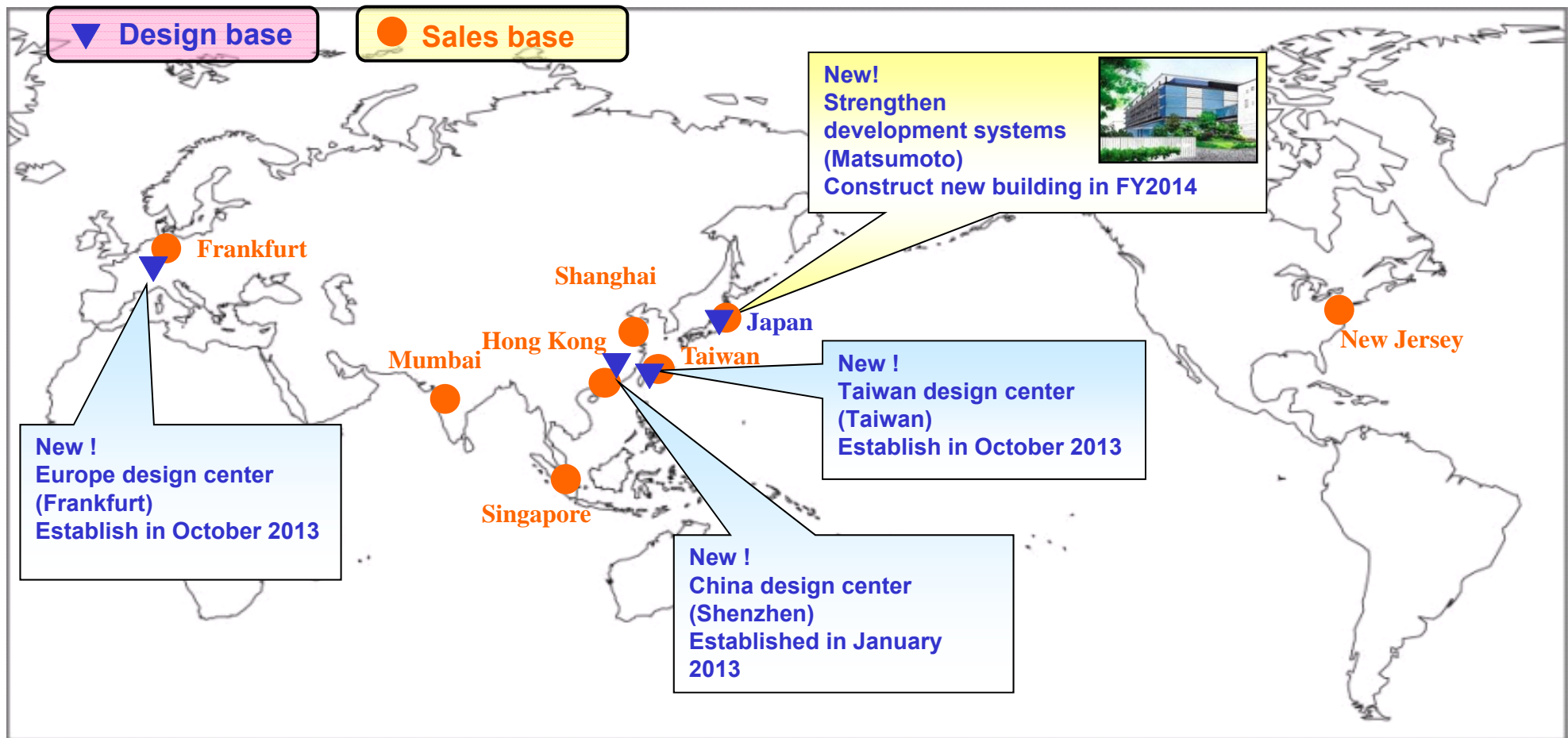


◆ SiC SBDs*5

*5) SBD; Schottky Barrier Diode

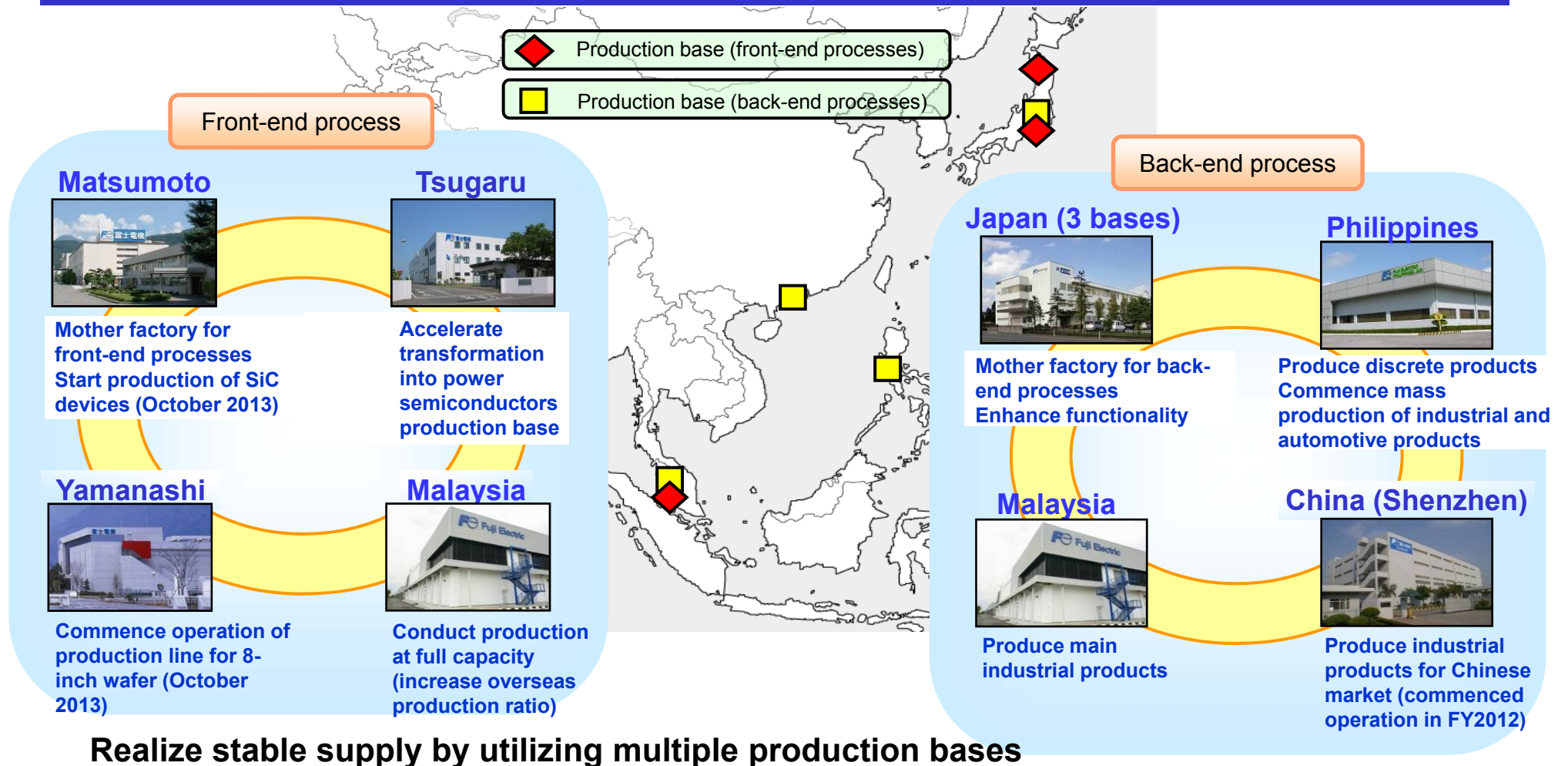
Globalization (Sales, Development, and Design)

- Strengthen the Company's world-leading design and development systems (consolidate engineering bases)
- Accelerate development of products that meet needs of overseas markets and promote local procurement of parts (establish design centers in Europe, China, and Taiwan)



Globalization (Manufacturing)

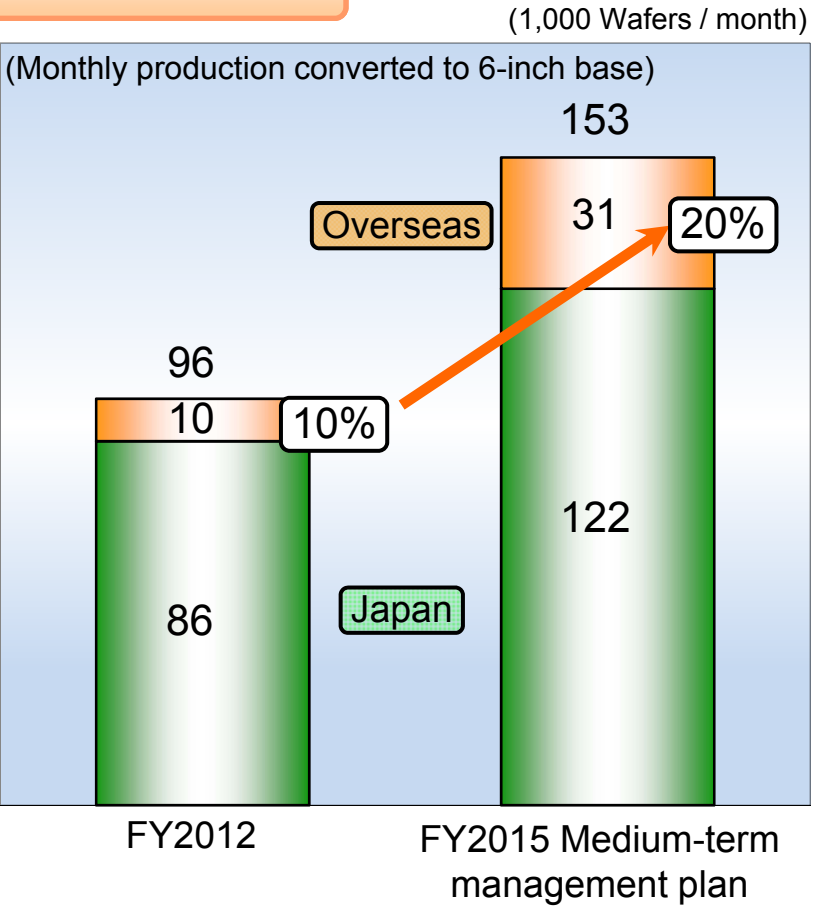
- Front-end processes: Improve productivity by reorganizing clean rooms
- Back-end processes: Increase overseas production ratio (35% → 60%), commence mass production of automotive products overseas



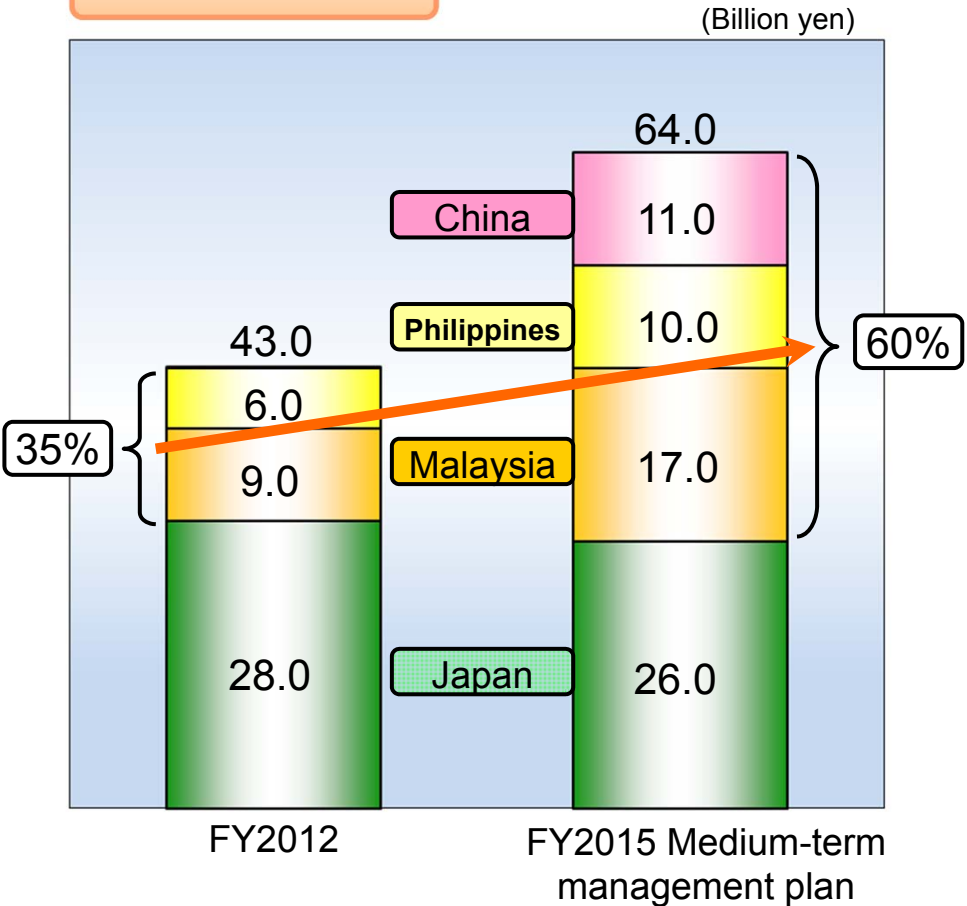
Production Levels by Base

- **Front-end processes:** Increase ratio of overseas production by operating Malaysian factory at full capacity and utilizing overseas wafer fabrication foundries
- **Back-end processes:** Substantially raise overseas production ratio by commencing operation of Shenzhen factory and starting mass production of automotive products

Front-End Processes



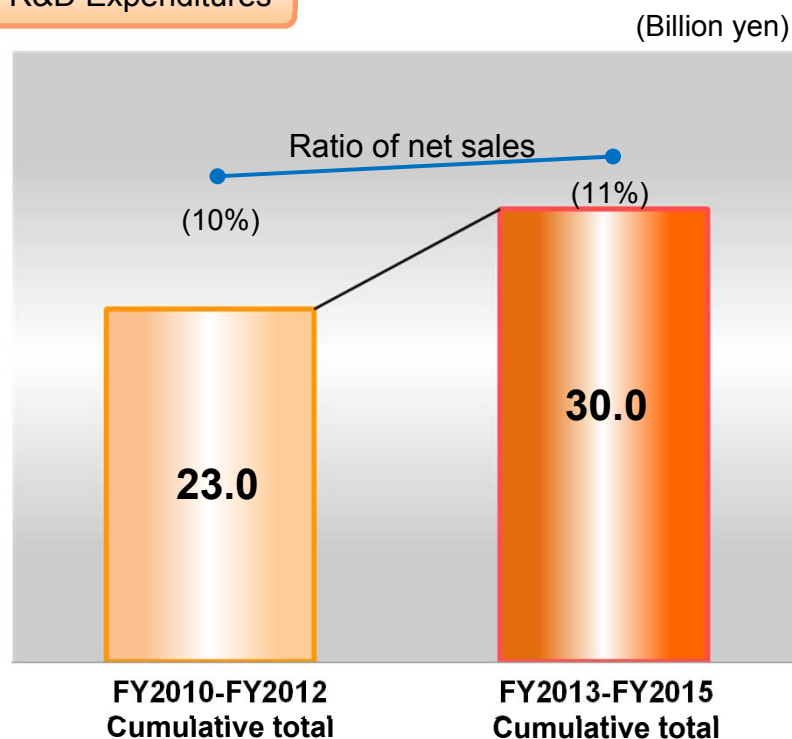
Back-End Processes



R&D Expenditures / Plant and Equipment Investment

- R&D expenditures: Concentrate expenditures in growth markets, accelerate development of new products
- Plant and equipment investment: Limit investment (shift focus from capacity expansion to new products and R&D)

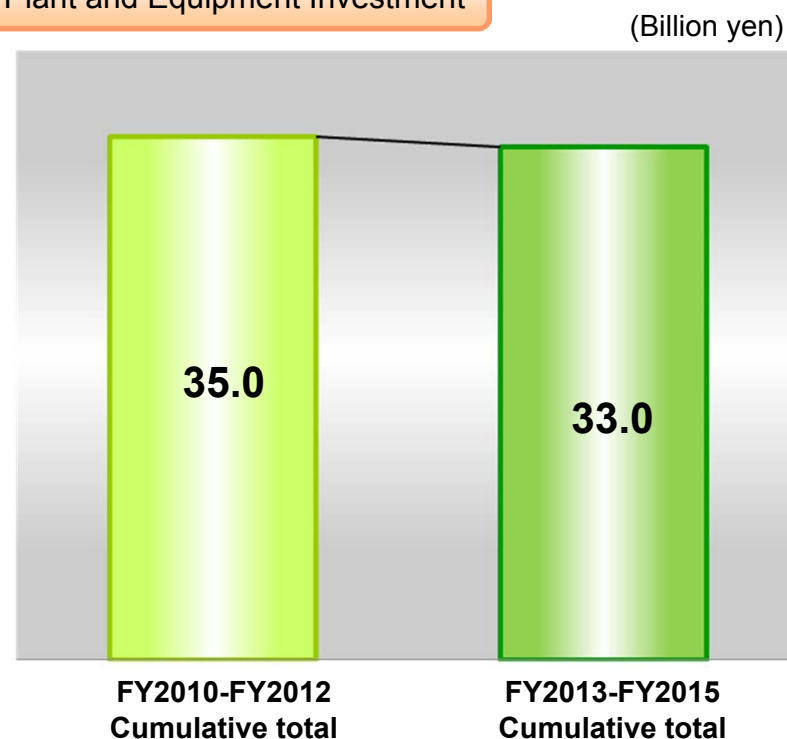
R&D Expenditures



Major themes for FY2013–2015

- SiC devices
- Next-generation power semiconductors (develop high value added products)

Plant and Equipment Investment



Major projects for FY2013–2015

- Introduction of SiC device production facilities
- Introduction of IGBT production facilities (Tsugaru Factory)
- Construction of new building at Matsumoto Factory

1. Statements made in this documents or in the presentation to which they pertain regarding estimates or projections are forward-looking statements based on the company's judgments and assumptions in light of information currently available. Actual results may differ materially from those projected as a result of uncertainties inherent in such judgments and assumptions, as well as changes in business operations or other internal or external conditions. Accordingly, the company gives no guarantee regarding the reliability of any information contained in these forward-looking statements.
2. These documents are for information purpose only, and do not constitute an inducement by the company to make investments.
3. Unauthorized reproduction of these documents, in part or in whole, is prohibited.