Fuji Electric
Innovating Energy Technology

Power Semiconductors Business Strategies

May 26, 2014

Fuji Electric Co., Ltd.

Electronic Devices Business Group

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Business Overview

Electronic Devices Segment

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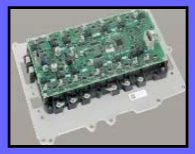
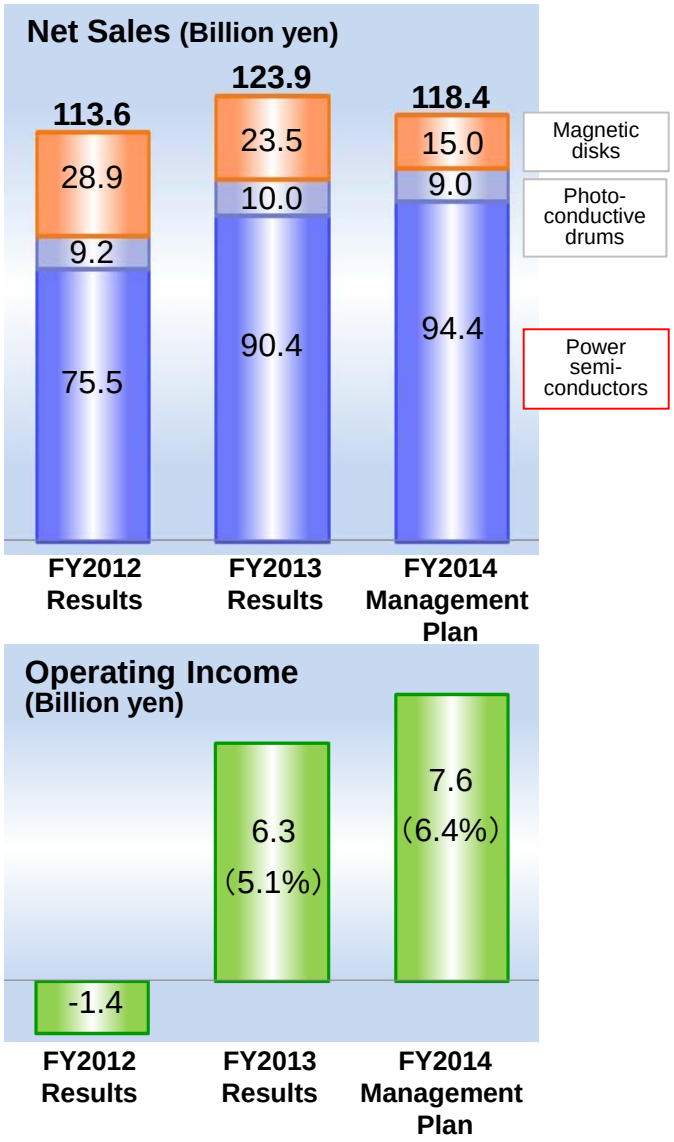
Subsegments	Major products	Application
Semi-conductors	Power semiconductors  	Inverters PCSs Air conditioners Automobiles Power supplies
	Photoconductive drums 	Copiers Printers
Magnetic disks	Aluminum substrate magnetic disks Glass substrate magnetic disks 	HDDs



※ PCSs：Power conditioner

Power Semiconductors Business Overview

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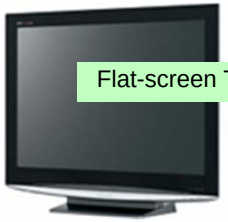
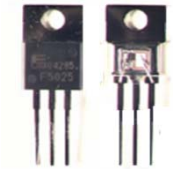
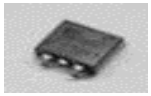
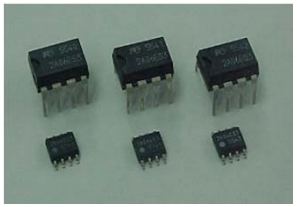
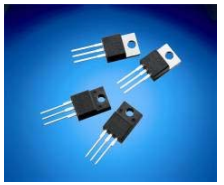
(FY2013)

	Industrial field (47% of total sales)	Automotive field (35% of total sales)	Power supply field (18% of total sales)
Application	 Inverters  Wind power generation		 Servers  Flat-screen TVs
	Inverters, NC machine tools, elevators, UPSs, PCSs (wind / solar power generation), air conditioners, etc.	Engine controls, transmission controls, brake controls, steering controls, HEV motor controls, etc.	Industrial equipment, communication equipment, servers, PCs, flat-screen TVs, video game consoles, copiers, printers, etc.
Products	**IGBT modules**   **SiC modules**  **RB-IGBT modules**  **Automotive IGBT IPMs** 	**Discrete products** **Pressure sensors**  **Igniters**  **Power ICs**    	**Discrete products**  **Power supply control ICs** **Diodes**  **MOSFETs**  
Features	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

※ SJ-MOS：Superjunction MOSFET

Market Trends

Power Semiconductors

Market Trends(Market in which Fuji Electric Participates)

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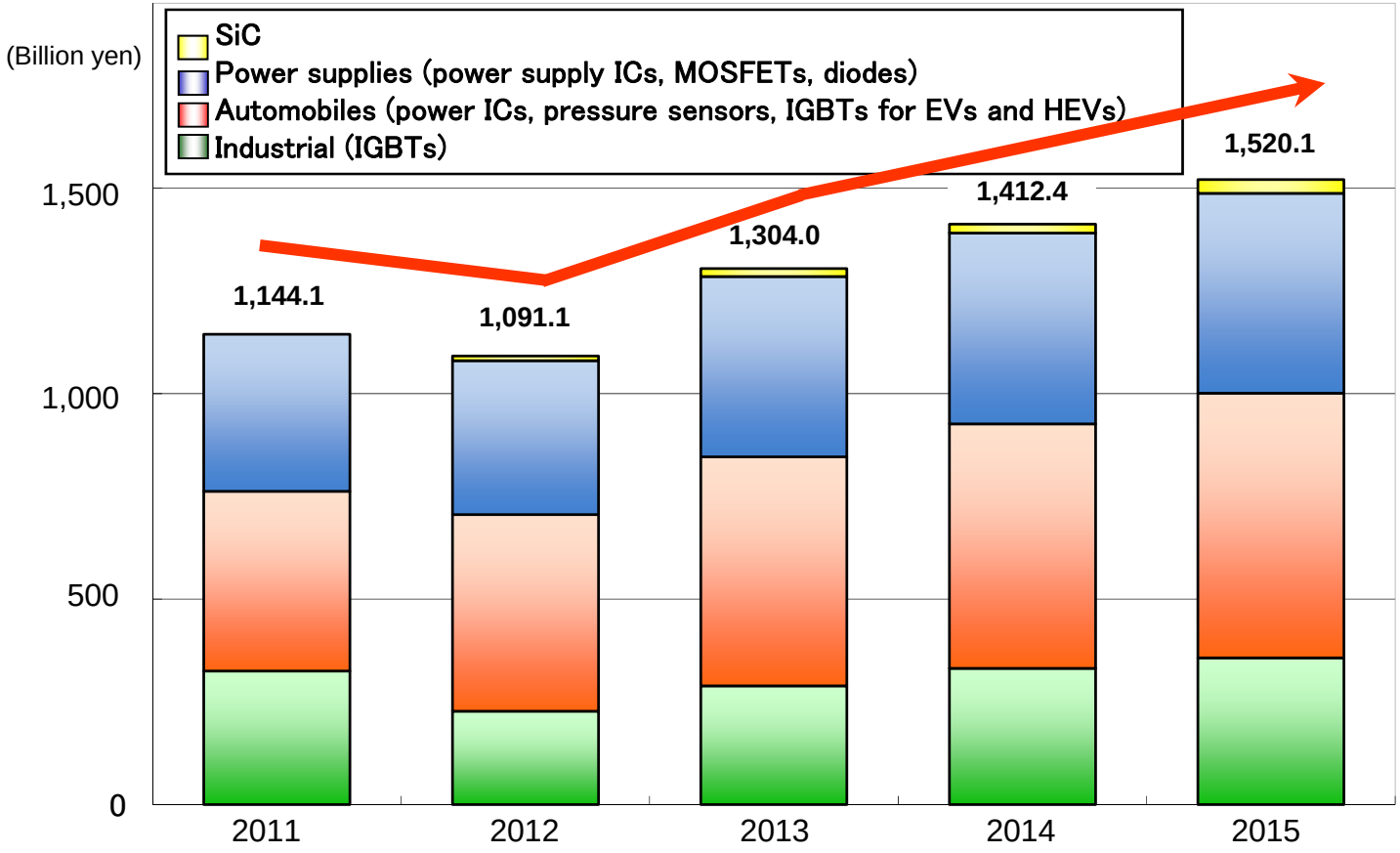
■ Market contraction in FY2012, average growth rate of 12% projected for FY2013 onward
■ Expansion in domestic markets for EVs, HEVs, and industrial equipment and overseas markets for industrial equipment, consumer electronics, new energy, and eco-friendly vehicles



2012–2015 CAGR
Entire power semiconductors market
11.7%

Power supplies
9.0%

Automobiles
10.4%

Industrial
16.2%

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

Business Targets

Power Semiconductor Business Targets

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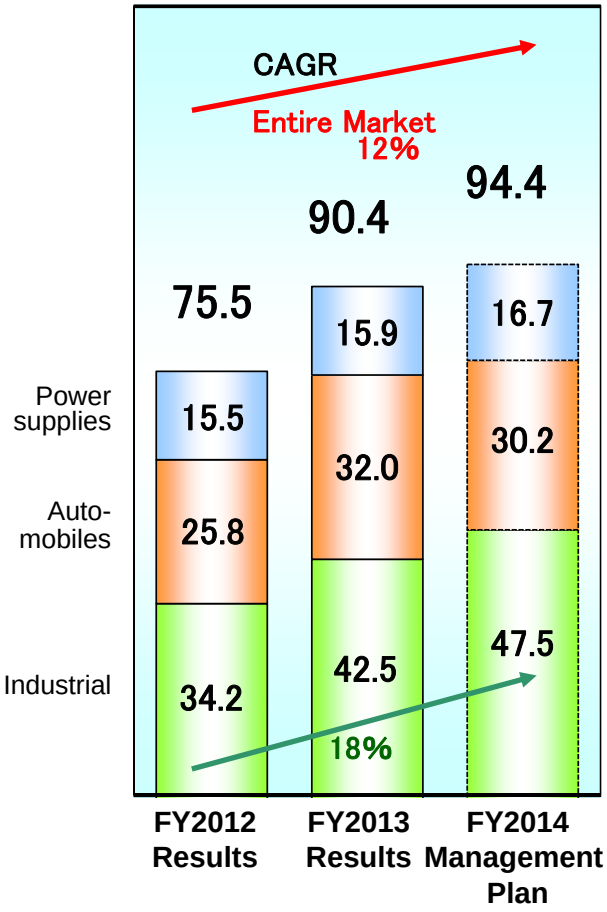
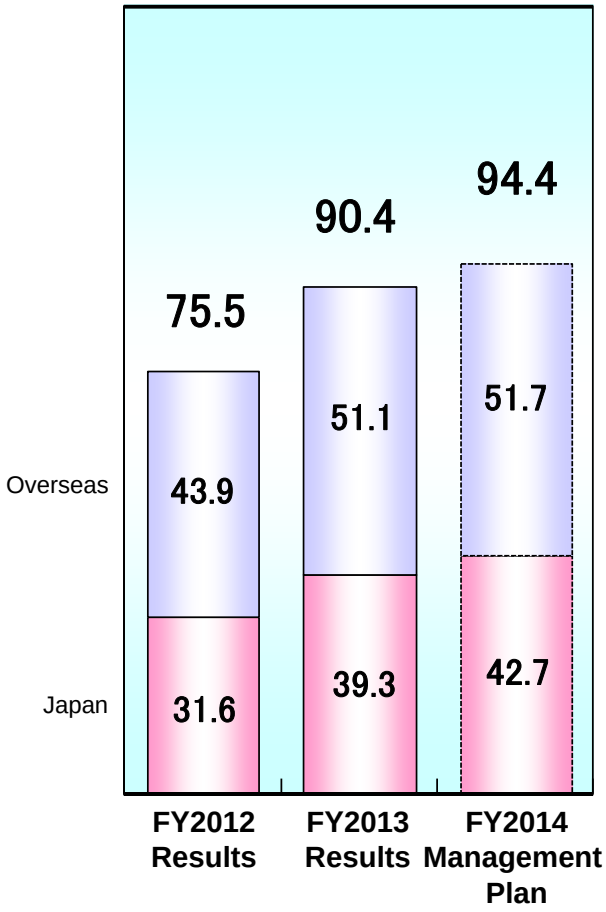
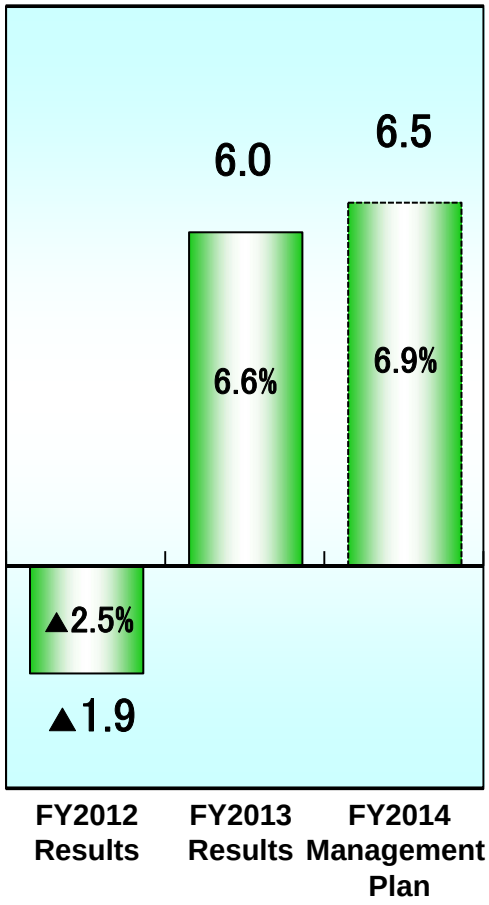
Net Sales by Business Fields
(Billion yen)



Net Sales in Japan / Overseas
(Billion yen)



Operating Income / Operating Income Margin (Billion yen)



Priority Measures

Power Semiconductor Priority Measures

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Basic Policy

- **Development of foundation for Accomplishing Goals ”Sales Target 100 billion yen” of FY2015 Medium-Term Management Plan**
- **Realization of 7% operating margin**
- **Accelerate development and Strengthen R&D structure**
- **Optimize global operations and improve cost competitiveness**

Priority Measures

●Expand sales

-Increase sales and expand market share by launching new products（⇒ Accelerate development）

-Increase sales through the enhanced local design in the Design Center（China / Taiwan / Europe)

●Accelerate development of next-generation power semiconductors

-Accelerate development of SiC product（commence mass production）

- Accelerate development of 7th generation IGBT（X-Series）

●Establish the optimal production structure to increase production

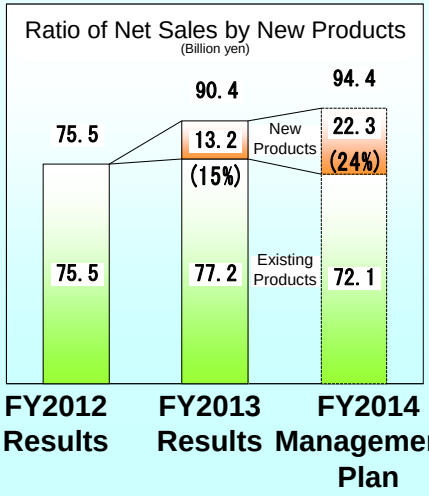
-Expand production on front-end process

-Expand overseas production on back-end process
(overseas production ratio 39%（FY2013), 47%（FY2014）)

-Step up overseas parts procurement
(overseas procurement ratio 32%(FY2013),40%(FY2014))

●Strengthen R&D structure

-Aggregation of technology and development department by the construction of the Development Center(Matsumoto Factory)
（Completion of new building in March 2015）



Industrial Field Overview of New Products

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☐ **Begin market launch of new products (including newly derived products) that achieve increasing levels of power conversion efficiency**
By taking advantage of their individual features, aim to boost market share in target fields
- Use RB-IGBT and SiC devices employing our proprietary technologies to achieve low loss levels
- Enable easy application in compact and high-radiation packages

Target	New Products	Features	Mass Production Timing
PCSs for Solar Power generation systems, UPSs	AT-NPC modules (RB-IGBT) 	Simple external wiring, low surge voltage, low loss	Two models under mass production, series expansion from November 2014
General-purpose Inverters, General-purpose Servo systems, Industrial air-conditioner, Motor drive in General	Small PIMs (V-Series) 	Compact and lightweight package, solderless mounting available	Under mass production
	Small IPMs (V-Series) 	Ultracompact package, includes drive IC and protection function	Under mass production for air conditioners, for industrial use from June 2014
	SiC Hybrid modules (V-Series＋SiC-SBD) 	Substantially reduced switching losses (such as 35%)	Under mass production
NC machine tools, General-purpose servo systems,injection molding machine	Medium capacity IPM, High heat dissipation type (V series) 	Increased overload tolerance, extended life, more compact (down 25% from previous models)	600V from September 2014, 1200V from November 2014

*AT-NPC：Advanced T-type Neutral Point Clamped　PIM：Power Integrated Modules　IPM：Intelligent Power Modules

Automotive Field Overview of New Products

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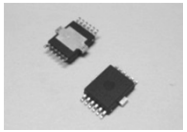
☐ **Begin market launch of new products (including newly derived products) that are more compact, lightweight and reliable**
- **Achieve low loss levels by employing next-generation trench IPS technology**
- **Employ enhanced protection function to achieve high levels of reliability**
- **Meet diverse customer design needs by providing low-voltage sensors as series**
- **By increasing sensor sensitivity, extend application to fuel tanks**

Target	New Products	Features	Mass Production Timing
Control of relays, solenoids, lamps, etc.	High-side IPS 	Enhanced protection function, low on resistance, highly sensitive current detection	from October 2014
Control of motors, etc., relay substitute	High-current IPS 	High L load tolerance, low on resistance, battery reverse-connection protection, auto-protection function	from January 2015
Control of solenoids, stepping motors, etc.	Low-side IPS 	Low resistance, high functionality, auto-protection function	Under mass production
Sensing of intake pressure, overpressure	Intake pressure, overpressure sensor 	Compact, lightweight, freeze-resistant	from August 2015
Sensing of fuel tank pressure	Fuel leak detection sensor 	Highly sensitive, increased fuel resistance	from June 2014

Power Supply Field Overview of New Products

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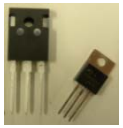
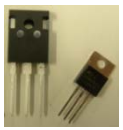
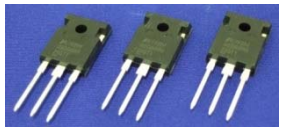
☐ **Begin market launch of new products (including newly derived products) that achieve energy savings**
- **Low-loss, low standby power**
- **Product lineup capable of responding to diverse customer designs**

Target	New Products	Features	Mass Production Timing
LCD TV 	Power factor control ICs 	Improved efficiency in Low-load Enhanced protection function	from January 2014
Printers 	PWM control ICs 	Low standby power Output current stabilization	from April 2013
PC power supplies  	Quasi-resonant ICs 	Sound prevention Low standby power	Under mass production
LED lighting  	Current resonance ICs 	Low standby power, Highly efficient MOS crash prevention	from October 2013
Servers 	SJ-MOSFET (600V) 	Low on resistance Low switching loss Low noise	Under mass production
Standard power supplies 	SiC SBD (650V, 1200V) 	Low Vf* High avalanche tolerance Low switching loss	from 3Q 2014
	RB-IGBT (600V) 	1-chip reverse blocking characteristic Low VCE(sat)* Ideal for AC switches	Under mass production

* Vf: Forward voltage on a diode; VCE(sat): IGBT on voltage

SiC Products

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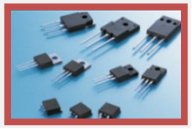
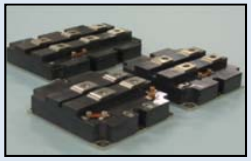
☐ Begin market launch of products that leverage features of SiC devices
- Accelerate development of application-specific SiC products

◎ Major benefits

Features of SiC-Semiconductors	Merit	Power Source Applications			Drive Applications					Electric Power Infrastructure
		General-purpose power supplies, industrial power sources	UPSs	PCSs	Inverters: Fans/ Pumps	Inverters: Conveyors	Inverters: Servo systems	EV/ HEV	Railcars	
Low-loss High-speed switching	High-efficiency	◎	◎	◎	◎	○	○	○	◎	◎
	Small / light-weight	○	◎	◎	○	○	○	◎	○	◎
	Highly accurate control					◎	◎			○
High-heat resistant / High-voltage	High reliability	○	◎	◎	○	◎	◎	◎	◎	◎
	Device voltage	600V/1.2kV/1.7kV							1.7/3.3kV	>3.3kV

Product	Low capacity	Medium / large capacity
SiC-SBD / SiC-MOSFET	SBD 	All SiC  '15～
	discrete	Highly reliable new power modules that are easy to connect in parallel
Si IGBT＋SiC Hybrid	6in1 7in1 modules	2in1 modules  1in1 modules 
		From the second half of FY2014

Under Mass production Under Development

Boost Sales through Localization (Overseas Design Centers)

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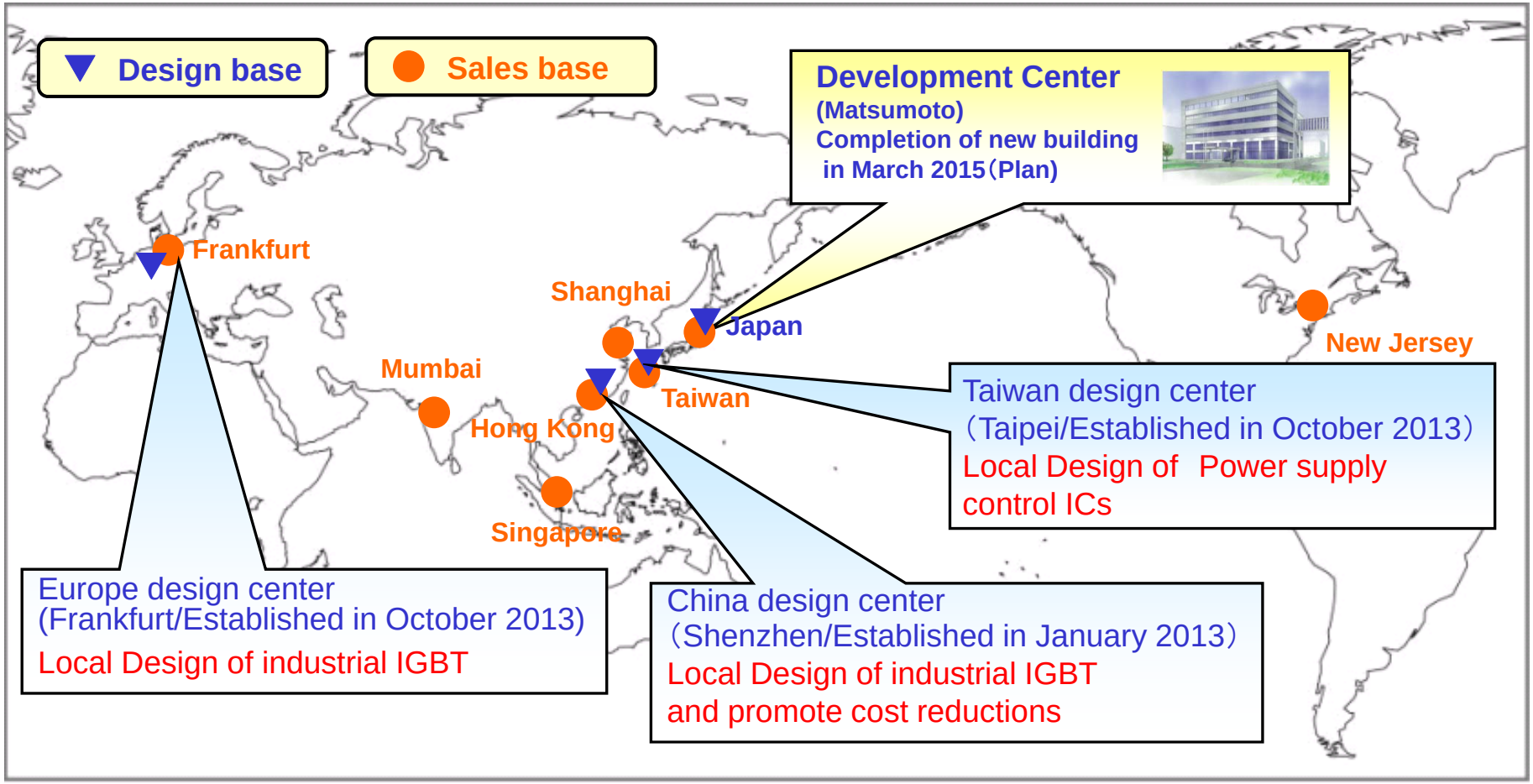
- Strengthen network of local bases that are design centers (China, Taiwan, Europe), accelerate product development to meet local needs, and work to increase local materials and component procurement ratios
- Establish the Development Center as the core global base for R&D



Plans for Production Bases in FY2014

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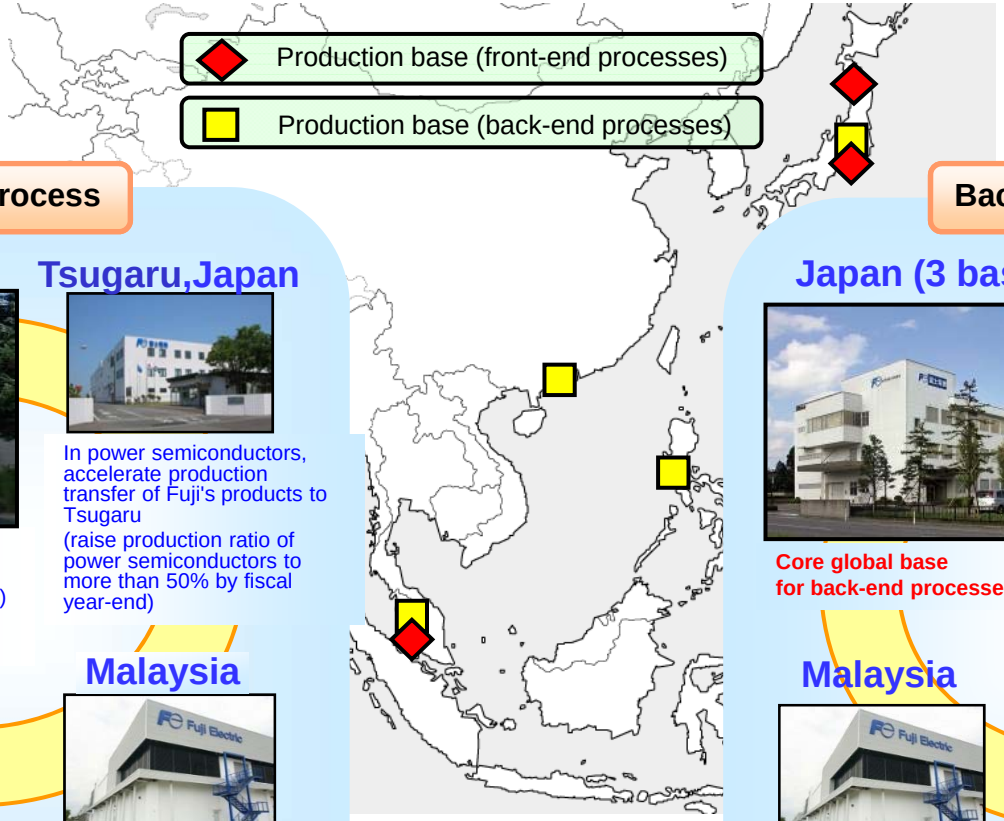
- **Front-end processes : Increase scale of production and promote larger diameters**
- **Back-end processes : Boost overseas production ratio, expand mass production of automotive products overseas**



Front-end process

Matsumoto,Japan

Core global base for front-end processes
Shift to larger diameters (6, 8 inch)
Move to full-fledged mass production of SiC devices

Tsugaru,Japan

In power semiconductors, accelerate production transfer of Fuji's products to Tsugaru
(raise production ratio of power semiconductors to more than 50% by fiscal year-end)

Yamanashi,Japan

Increase production of 8-inch IGBT series
(full operation by fiscal year-end)

Malaysia

Expand IGBT series under production (boost overseas production ratio)

Back-end process

Japan (3 bases)

Core global base for back-end processes

Philippines

Production base for power supply products
Expand production of industrial and automotive products

Malaysia

Increase production of industrial IGBT series

China (Shenzhen)

Produce industrial products for Chinese market
Augment production capacity

Plant and Equipment Investment / R&D Expenditures

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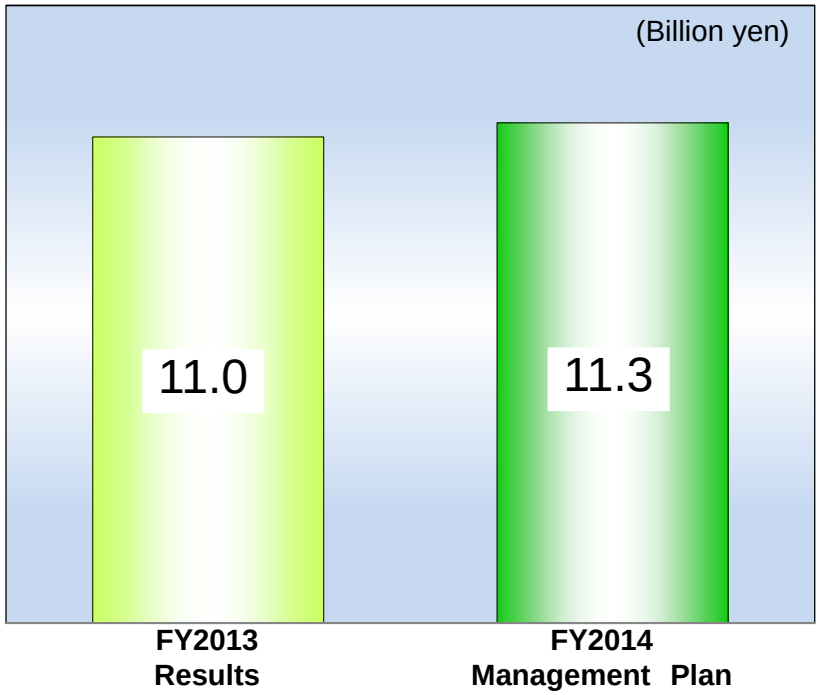
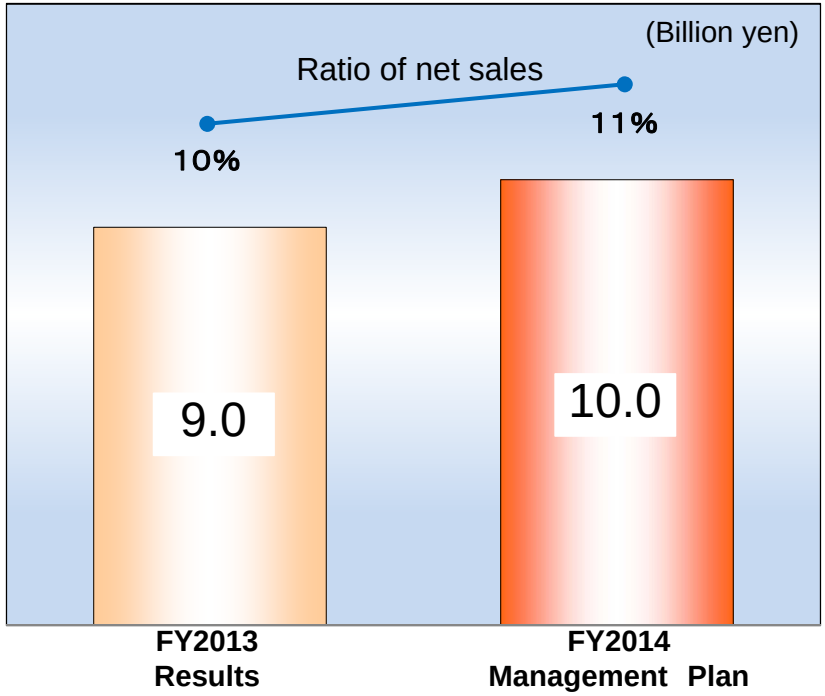
- **Plant and equipment investment : shift focus from capacity expansion to R&D investment for new products and Next-generation products**
- **R&D expenditures : Next-generation products(SiC / 7th generation IGBT) , accelerate development of new products**

Plant and Equipment Investment



【Major themes in FY2014】
- **Construction of Matsumoto development center (¥4.8 billion)**
- **Introduce 7th generation IGBT module development facility**
- **Introduce SiC device development facility**

R&D Expenditures



【Major themes in FY2014】
- **Develop SiC device mass production technology**
- **Develop 7th generation IGBT modules**
- **Expand series of industrial IGBT and power IC products**

Note: R&D expenses are classified into segments according to theme. Consequently, the figures differ from the numerical values indicated in the Consolidated Financial Report for the fiscal year ended March 31, 2014.

【Development Center】Overview

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Construct the Development Center at the Matsumoto Factory,
our core global base for power semiconductor R&D and production technologies

Combine into this factory the technology and development divisions that are currently dispersed
(enhance information sharing and collaboration)

Display leading-edge technologies and products

[Accelerate product and technology development]
- Develop next-generation power semiconductors
- Develop high-value-added products
- Develop revolutionary production technologies

Enhance our presence with customers

[Structural overview]

- Location：Matsumoto, Nagano Prefecture,Japan
  (within Fuji Electric's Matsumoto Factory)
- Structure：Steel frame, seismically isolated structure,six floors above ground
- Building area：Approximately 2,700 m2 (40m x 67m)
- Site area：12,500 m2
- Investment：Approximately ¥4.8 billion
- Completion：March 2015 (plan)

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