Semiconductors Business Group
Research and Development looking toward FY2026

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Business Overview

Contributions to vehicle electrification, more compact power electronics, energy savings, and CO_2 emissions reductions

Automotive
(Domestic sales: 68%: Overseas sales 32%)

xEVs / Gasoline Vehicles

xEV motor control, engine control, transmission control, brake control, steering control, etc.

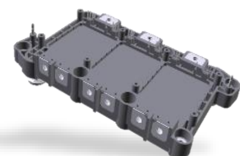
Net sales (FY2023 results)
¥228.0 billion
(Domestic sales: 47%; Overseas sales: 53%)*

Modules
85%

Automotive 55%
Industrial 45%

Industrial modules

Automotive modules



Automotive discrete devices

Industrial discrete devices
Photoconductors

Industrial
(Domestic sales: 23%: Overseas sales 77%)

FA (invertors, servos)

Air conditioners (commercial/household)

Renewable Energy (wind power, solar power)

Flat-screen TVs

Miniature UPSs

Printers

Note: Percentages of total net sales figures represent FY2023 results and are calculated before deduction and adjustment for inter-segment sales.

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Key Development Themes of FY2026 Medium-Term Management Plan

Fuji Electric Business and Products

Exploring

Entered

CAGR of 6–20%

Growth Fields
→Green transformation,digital transformation, and global markets

Major New Products

CAGR of 10–40%

New Fields
Creation of new products and businesses in preparation for market growth projected to begin in 2027

Global Markets
Plant-use drive switchgears and controlgears

Green Transformation
Data center products
Renewable energy products
Ship and harbor products
Power semiconductors

Digital Transformation
Factory digital transformation (smart factories)
Vending machine digital transformation (vending machine IoT services)
Store digital transformation (convenience store energy saving solutions)

Existing Fields

CAGR of 2–9%

Targets leading up to FY2026 (Directly linked to businesses)

Targets leading up to FY2030 (Development areas)

Existing Markets

Current growth markets and new markets

Target Markets

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Market Outlook and Technical Requirements (Automotive)

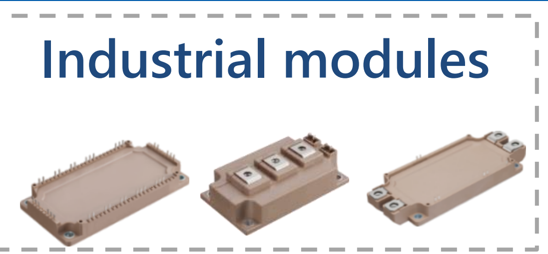
Demand for more compact, low-loss, and reliable power modules in response to needs for longer driving distances, larger vehicle interiors, and lower failure rates for electrified vehicles

Automotive module

Equipment	Needs	Technical Requirements for Power Modules
Drive inverters Battery / INV / INV / G / Engine / M/G	・Longer driving distances (improved electricity efficiency) ・More-compact and lighter-weight batteries ・Larger vehicle interiors ・Lower failure rates	・Compact design ・Lower losses ・Higher reliability

Market Outlook and Technical Requirements (Industrial)

Demand for power modules with increased output, lower loses, and higher reliability driven by needs for greater resource and energy efficiency and longer lifespans



Equipment	Needs	Technical Requirements for Power Modules
Renewable energy PCS	・Resource efficiency (more-compact equipment) ・Energy efficiency (higher efficiency) ・Low failure rates ・Longer lifespans	・Increased output (compact design) Need for fewer modules thanks to higher output ・Lower losses ・Higher reliability
Factory automation	・Resource efficiency (more-compact equipment) ・Energy efficiency (higher efficiency)	

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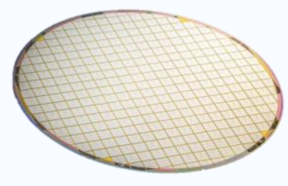
R&D Policy

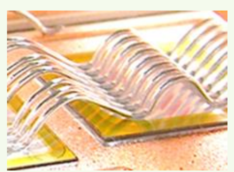
Promote development of modules that are more compact and reliable and feature lower losses with world-leading chip and package technologies

Chip Technologies



- Low losses (compact design)
  - ✓ IGBTs, RC-IGBTs
  - ✓ SiC MOSs

Package Technologies



- Operation at higher temperature
- Larger current
  - ✓ Automotive
  - ✓ Industrial

Modules

- Compact design
- Loss losses
- High reliability

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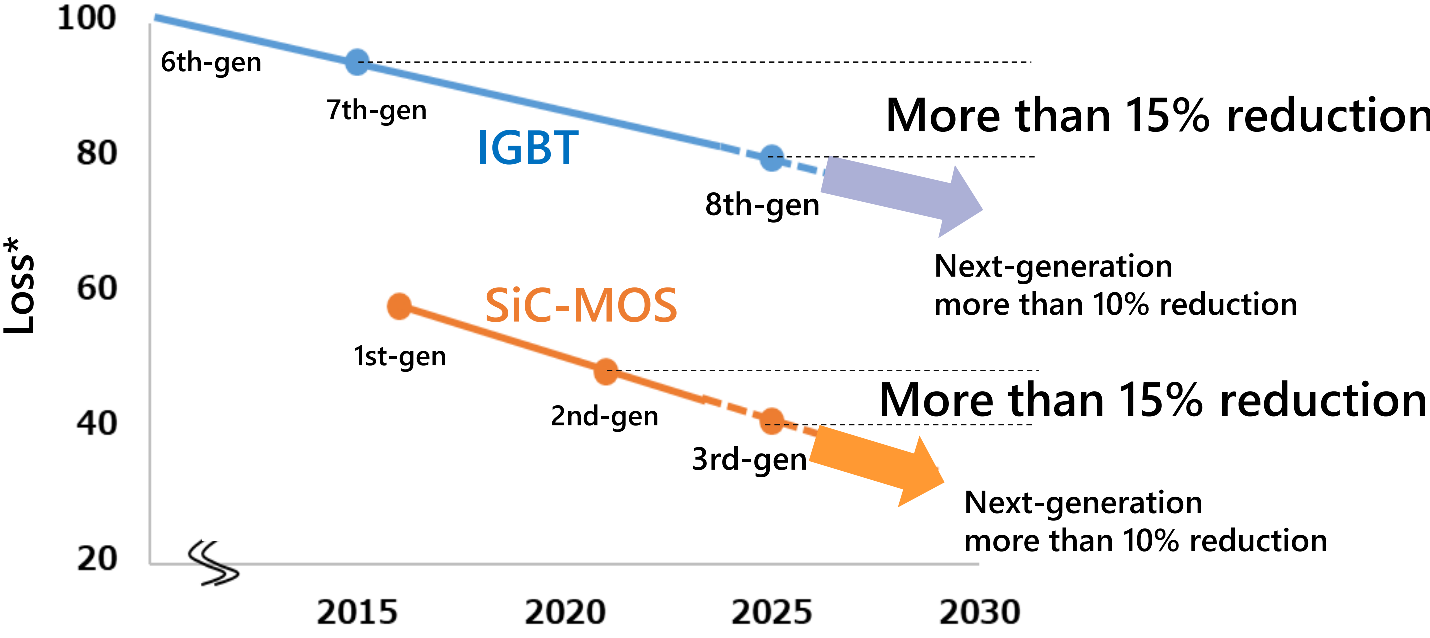
Reduction of Losses for IGBTs and SiC MOSs

Development of new products (8th-generation IGBTs, 3rd-generation SiC MOSs) and next-generation products with lower losses

- ✓ 8th-generation IGBTs: Reduction of losses through unique surface structure and thinner wafers
- ✓ 3rd-generation SiC MOSs: Reduction of losses through new structure (proprietary precision-engineered structure)



* 6th-generation Si-IGBTs indexed to 100

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Compact Design Using RC-IGBTs

Promotion of compact design using latest chip technologies based on past successes adopting these technologies for use with electrified vehicle drive inverters

✓ Limitation of heat generation with RC-IGBTs employing chips with size equal to combined size of IGBTs and FWDs allowing for smaller chips to be used for same temperature ranges

IGBT + FWD → RC-IGBT (FWD, IGBT)

IGBT, FWD → 33% reduction in heat generation → RC-IGBT

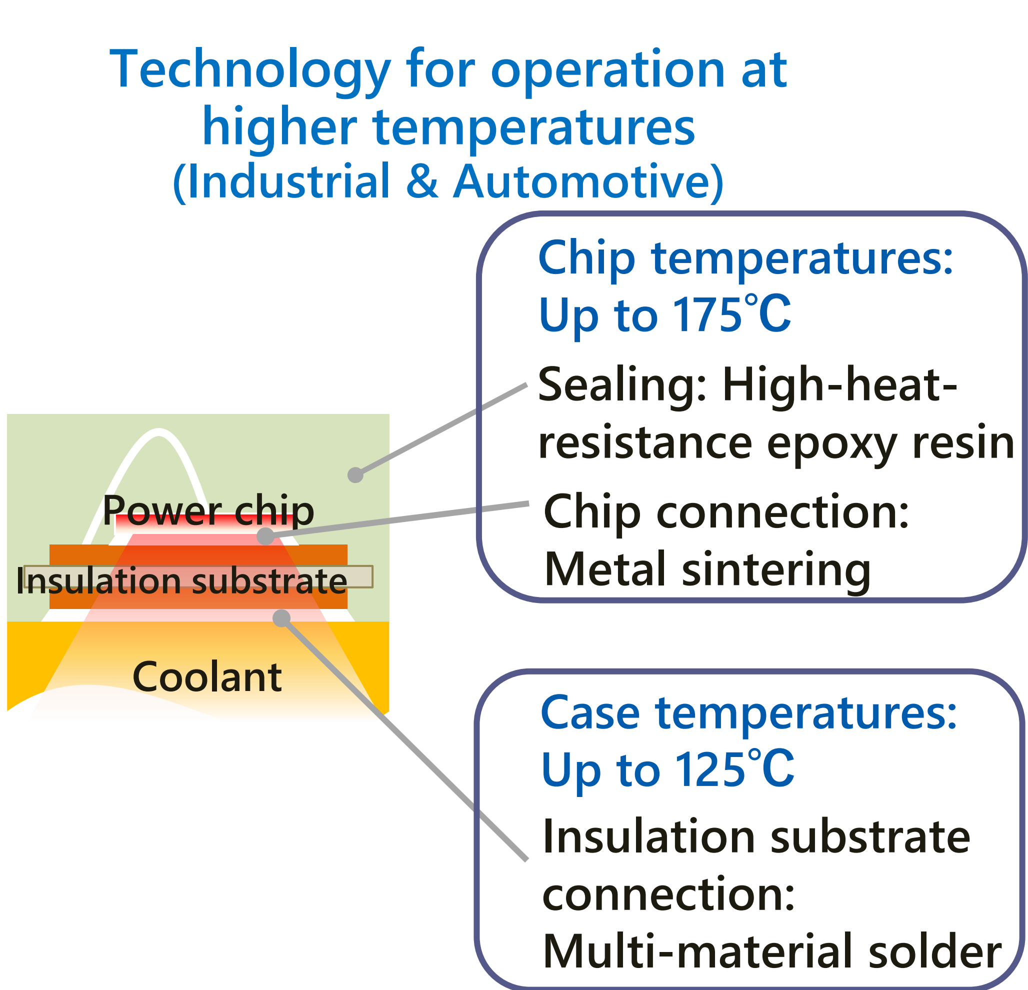
Low temperature — High temperature

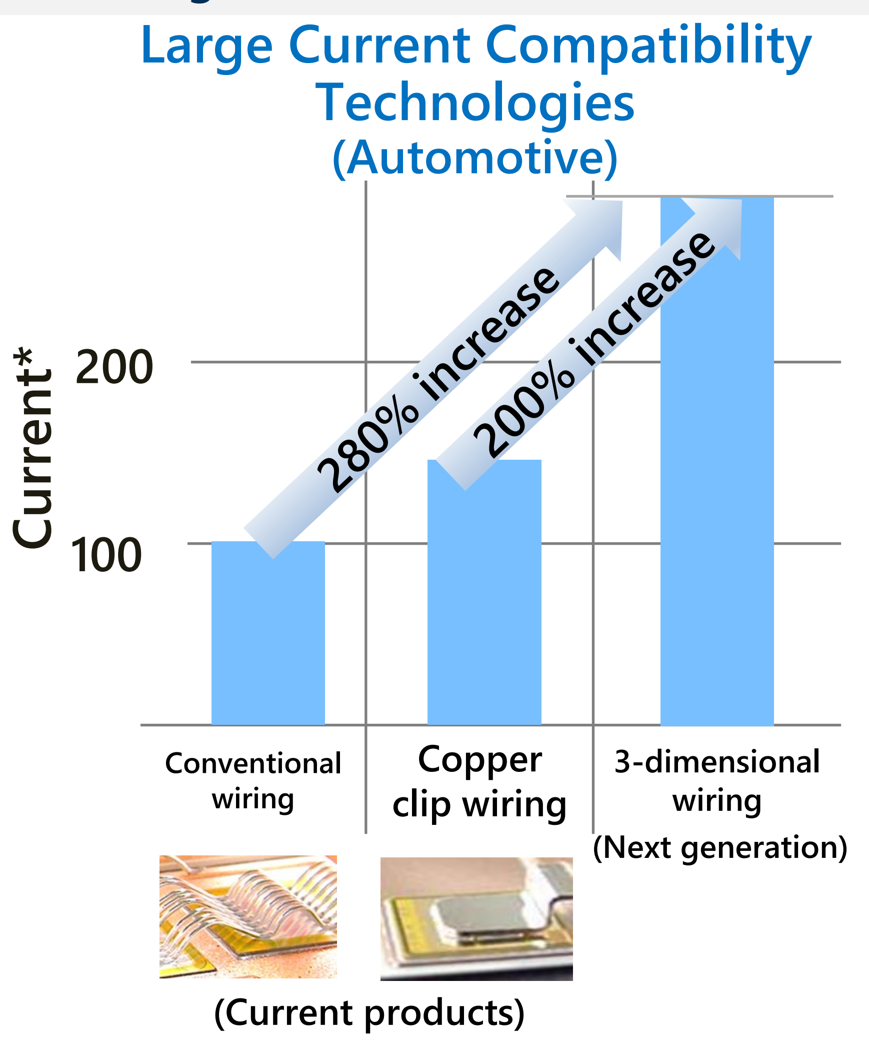
Chip size*: 7th-generation IGBT + FWD (Prior model) 100 → 7th-generation RC-IGBT (25% reduction) → 7.5-generation RC-IGBT (15% reduction)

* 7th-generation IGBT + FWD indexed to100

Packaging Technology: Operation at higher temperature and larger current

Increases in package output (through compact design) using technologies for achieving operation under high temperatures and compatibility with large current





* Conventional wiring indexed to 100

Compact Module Design

Evolution of chip and package technologies to achieve industry-leading levels of compact design

Module size*

150
100
50
0

2005 2010 2015 2020 2025 2030

IGBT
Industrial
7th-gen
17% reduction
78% reduction
8th-generation IGBT modules
IGBT
SiC MOS
IGBT
RC-IGBT
Automotive
Next-generation SiC Modules
SiC MOS

* 7th-generation industrial modules (2015) indexed to 100

Product Launch Schedule

Industrial modules: Launch of 8th-generation IGBTs and SIC modules in late FY2025
Automotive modules: Launch of RC-IGBT modules for compact and light vehicles in late FY2025 and SiC modules for battery-electric vehicles in FY2026

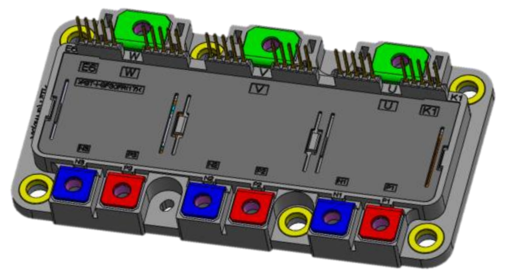
Semiconductor Type			FY2023	FY2024	FY2025	FY2026	FY2027	FY2028
Industrial	Renewable Energy		7th-generation IGBTs		Large-capacity SiC modules 3rd-generation SiC MOSs / 8th-generation industrial IGBT modules			
	Factory Automation							
Automotive	Battery-electric vehicles		4th-generation RC-IGBT modules			Next-generation SiC modules 3rd-generation SiC MOSs		
	Hybrid-electric vehicles	Medium/ Large						
		Compact /Light			Compact RC-IGBT modules			

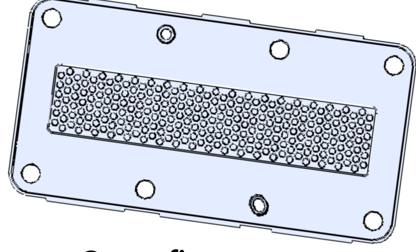
Use of latest RC-IGBT technologies and open fin structures to achieve industry-leading levels of compact design

Features and Strengths of Compact RC-IGBT Modules

25% reduction in size
50% reduction in height
Note: In comparison to prior models

◆ Compact and Low-Profile Design





Open fin structure

Dimensions: W136 mm × D70 mm × H14 mm

◆ Compatibility with outputs of 50 kW, 75 kW, and 100 kW via changes in chips and fins without changing dimensions

Inverter output	50 kW	75 kW	100 kW
RC-IGBT chip size	Small	Increase →	Large
Cooling structures		Flat base → Enhance	Pin fin

Development Focuses

- High reliability achieved using on-chip sensors
- Low-profile via open fin structure

Launch Timing

- Mass-production scheduled to commence in FY2025

Contributions to more compact industrial equipment through increased output via use of 8th-generation IGBTs and functionality under high temperatures

Features and Strengths of 8th-Generation IGBT Modules

8th-generation
Increase of rated current
without changing package

◆ Increases to Output (1.2 kV specification models)

Product Class	Rated Current (A)									
	20	–	200	250	–	800	1000	–	1500	1800
Small capacity			Increase							
Medium capacity				7th-gen		Increase				
Large capacity									Increase	

◆ Benefits of Higher-Current Products—Reduction of Inverter Size

7th-gen

When using 7th-generation IGBT

8th-gen

50% reduction in space used for modules

When using 8th-generation IGBT

Development Focuses

- Increased output due to functionality under high temperatures

Launch Timing

- Mass-production scheduled to commence in FY2025

Higher output and efficiency achieved through use of 3rd-generation SiC MOSs and new packages

Features and Strengths of Large-Capacity SiC Modules

◆ Increased output (50% increase in comparison to 7th-generation IGBTs)

60% reduction in loss in comparison to 7th-generation IGBTs

Dimensions: W140 mm × D100 mm × H40 mm

◆ Planned Product Lineup

	Rated Voltage	Rated Current
Large-capacity SiC modules	2.3 kV	1200 A
	3.3 kV	850 A

Development Focuses

- Reduction of loss through low inductance
- Optimization of port layout to enhance ease of parallel connection

Launch Timing

- Mass-production scheduled to commence in FY2025

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