



Fuji Electric Corporate Overview

Richardson Electronics
25 October 2017



10/26/2017

Confidential and Proprietary Information

Fuji Electric - Who We Are



- Fuji Electric is a global manufacturer with products ranging from the small discrete IGBT to the world's largest power generation systems
- Based in Tokyo, Japan, our company has a 90+ years reputation for world-class engineering and innovation, with a firm commitment to the environment
- Fuji Electric Corp. of America (FEA) was established in 1970 and is a wholly-owned subsidiary of Fuji Electric Co., Ltd. Japan with Corporate HQ in Edison, NJ
- FEA is responsible for the Sales, Marketing, and Distribution of FE products in the Americas



Established in
1923

Products sold in
61
countries

\$7.4B USD
in annual sales

Fuji Electric By The Numbers



HQ: Shinagawa, TOKYO

122
sales and service
locations worldwide

26,508
employees worldwide

317,500
Products designed &
engineered

Corporate History

1923
■ Fuji Electric Manufacturing Co., Ltd., established
Established as a capital and technology alliance between Japan Furukawa Electric Co., Ltd., and German Siemens AG. The result is a company with characteristics inherited from industry in both countries.



1925
■ Began operation of the Kawasaki Factory

1935
■ Established Fuji Tsushinki Manufacturing Co., Ltd. (present Fujitsu Limited), by spinning off the Telephone Department

1942
■ Began operation of the Matsumoto Factory

1943
■ Began operation of the Fukiage and Toyoda factories

1944
■ Began operation of the Mie Factory

1961
■ Began operation of the Chiba Factory

1968
■ Merged with Kawasaki Denki Seizo Co., Ltd., and commenced operations at the Kobe and Suzuka factories

1973
■ Began operation of the Otawara Factory

1984
■ Changed company name to Fuji Electric Co., Ltd.

1991
■ Began operation of the Yamanashi Factory

2002
■ Introduced Company symbol mark



2003
■ Changed name to Fuji Electric Holdings Co., Ltd., owing to shift to pure holding company system

2008
■ Established METAWATER Co., Ltd. (joint venture with NGK Insulators, Ltd.)

■ Fuji Electric FA Components & Systems Co., Ltd., merged operation with Schneider Electric Japan Ltd. (Power distribution and control equipment joint venture)

2011
■ Changed company name to Fuji Electric Co., Ltd.

■ Established GE Fuji Meter Co., Ltd. (joint venture with General Electric)

2012
■ Introduced brand statement
Innovating Energy Technology

2013
■ Began operation of the factory at Fuji Electric Manufacturing (Thailand) Co., Ltd.

2014
■ Created new corporate brand emblem for products



■ Established Fuji SMBE Pte. Ltd. (Singapore)

2015
■ Established Reliable Turbine Services LLC (United States)

■ Completed new power semiconductor research and development building at Matsumoto Factory

2016
■ Established Fuji Nztelligence GmbH (Germany)

■ Established Fuji CAC Joint Stock Company (Vietnam)

■ Established Fuji SEMEC Inc. (Canada)

■ Completed new Companywide research and development building at Tokyo Factory

1920-1980

1924
■ Began manufacturing electrical machinery

1925
■ Began transformer production

1927
■ Began electric fan production

1930
■ Launched mercury-vapor rectifier production



1933
■ Began expansion circuit breaker production

1936
■ Built first hydraulic turbine, 4,850HP Francis Turbine



1937
■ Began watt-hour meter production

1954
■ Began ultra-compact magnetic switch production



■ Began volume production of selenium rectifiers in response to exploding demand for televisions and radios. Fuji Electric began volume production of selenium rectifiers, electronic components that convert alternating current (AC) to direct current (DC). The Company soon took an 80%-90% share of the domestic selenium rectifier market.

1955
■ Began manufacturing juicers
Sales of juicers took off from around 1961, playing a role in a nationwide health movement (campaign).



■ Full-scale foray into thermal power plant business
Signed a contract with Siemens AG for technology transfer of the steam turbine manufacturing. Subsequently delivered the first super-critical, variable pressure turbine in Japan, which was one of the largest in the country at the time. This move to import European technology marked a change of tack in a domestic power generation market dominated by U.S. technology.

1959
■ Began manufacturing silicon diodes

1965
■ Electric propulsion system fitted to Antarctic exploration ship Fuji



1969
■ Began production of vending machines
Used know-how as a vendor of refrigerated milk showcases to move into vending machines. Delivered 230 beverage vending machines to the 1970 Osaka World Exposition, promoting the wider spread of domestically made vending machines.



1971
■ Developed centralized monitoring and control systems for power utility companies
First computerized control system in Japan, using the FACOM-R mini-computer

■ Began hybrid IC manufacture

1973
■ Began production of selenium photoconductive drums

1976
■ Began manufacturing general-purpose inverters
First in the industry to develop general-purpose inverters.



■ Developed transistor inverter FRENIC5000G

1978
■ Began research into amorphous solar cells

1981
■ Developed and commenced manufacture of electric propulsion system for ice-breaking ship Shirase

1985
■ First generation mini UPS "M-UPS Series" launched

■ Released the programmable logic controller "MIGREX-F Series"

■ Developed 1,000kW phosphoric acid fuel cell

1987
■ Developed IGBT module

1990

1991
■ Developed 2.5-inch magnetic disks

1992
■ Began development of solar cells formed on film substrates
■ Completed an ozone-based water treatment system

1993
■ Delivered the first generator (600MW output) of Noshiro Power Station

■ Completed a ski lift gate system

1996
■ Won order for IGBT main conversion devices used in electric railways (world's first large-capacity flat IGBT)



1998
■ Delivered 100kW phosphoric acid fuel cell

1999
■ New mini-UPS "J-Series" launched



2000

2006
■ Commenced mass production of film substrate amorphous solar cells
Began mass-producing flexible amorphous solar cells based on plastic film substrates.



2007
■ Began mass production of perpendicular magnetic recording media
Full-scale mass production of world's largest capacity 2.5-inch glass substrate media (160GB/disk), 3.5-inch aluminum substrate media (334GB/disk).



2009
■ Released high-voltage drop/dip compensator using a lithium-ion capacitor.
The world's first embedded lithium-ion capacitor realized environmental impact reduction with a significantly smaller package.

2010

2010
■ Developed a new three-level converter circuit and a new three-level power module, realizing highly efficient electric power conversion

■ 140MW geothermal power plant, the largest single-unit capacity in the world, started operation



■ Development of next-generation SiC module power semiconductor



2011
■ Launched sales of medium-voltage inverter with water-cooling system "FRENIC4800VM5"

2012
■ Launched dedicated inverters for air-conditioning and water treatment systems, FRENIC-HVAC and FRENIC-AQUA

■ Development of inverter equipped with next-generation power semiconductor SiC-SBD, a first in Japan



■ Launched power conditioning sub-system for mega solar power generation systems



2014
■ Launched power electronics equipped with SiC power semiconductors



FRENIC-VG



Power conditioning sub-system for high-capacity mega solar use

2015
■ Launched aerosol analyzers
Began contributing to elucidation of nature of PM2.5



■ Launched steam-generation heat pumps
Started making contributions to energy savings through recycling of low-temperature factory exhaust heat



Technology and Product History

FE Fuji Electric

Fuji Electric's Energy-Related Business



With electric and thermal energy technology as core technologies, Fuji Electric contributes to the creation of responsible and sustainable societies through its five business sectors.

Power and Social Infrastructure

By integrating environmentally friendly electric power plants and energy management, Fuji Electric will contribute to the realization of smart communities.

- Steam turbine
- Power generation facilities
- Fuel cells
- Cluster energy management system
- Electric power storage systems



Steam turbine



Cluster energy management system

Industrial Infrastructure

Fuji Electric supplies diverse customers in the fields of industry with "energy savings" and "lifecycle services" for production lines and infrastructure equipment.

- Substation equipment
- Rectification equipment
- Industrial Drive system
- Monitoring control systems
- Data centers
- Industrial measuring instruments



Electric substation equipment



Industrial drive system

Power Electronics

Fuji Electric supplies products that incorporate power electronics technology to improve the efficiency and stability of energy.

- General-purpose and industrial inverters
- Synchronous drive systems
- Transit Equipment
- Uninterruptible power supply systems
- Magnetic switches / Molded-case circuit breakers



Door systems for rail cars



General-purpose inverters



Magnetic switches



Uninterruptible power supply systems

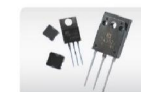
Electronic Devices

Fuji Electric supplies power semiconductors and other essential electronic devices to the fields of industrial equipment, automobiles, information equipment, and new energy.

- Power semiconductors
- Organic photoconductive drums
- Magnetic disks



High power IGBT modules



Power MOSFET

Food and Beverage Distribution

With our freezing technology at the core, we integrated mechatronic technology and IT to offer optimal products and solutions to our customers.

- Vending machines
- Food service equipment
- Freezer and refrigerated showcases
- Energy-saving stores
- Distribution systems



Vending machine



Freezer and refrigerated showcases

The Relation between Fuji Electric's Core Technologies and Business



Application of “Electric and Thermal Energy Technologies” Based on Power Electronics Technology

Power and Social
Infrastructure

Industrial
Infrastructure

Food & Beverage
Distribution

Power Electronics

Electronic Devices

(Power Semiconductors)

Energy
Saving



Energy
Management



Energy Creation
(Renewable Energy)



Control Solutions of “Electricity + Thermal” Energy

Power Electronics
Technology



Thermal Technology
(Heat Pump, Induction Heating)



Instrumentation
Technology



Power Semiconductor Technology



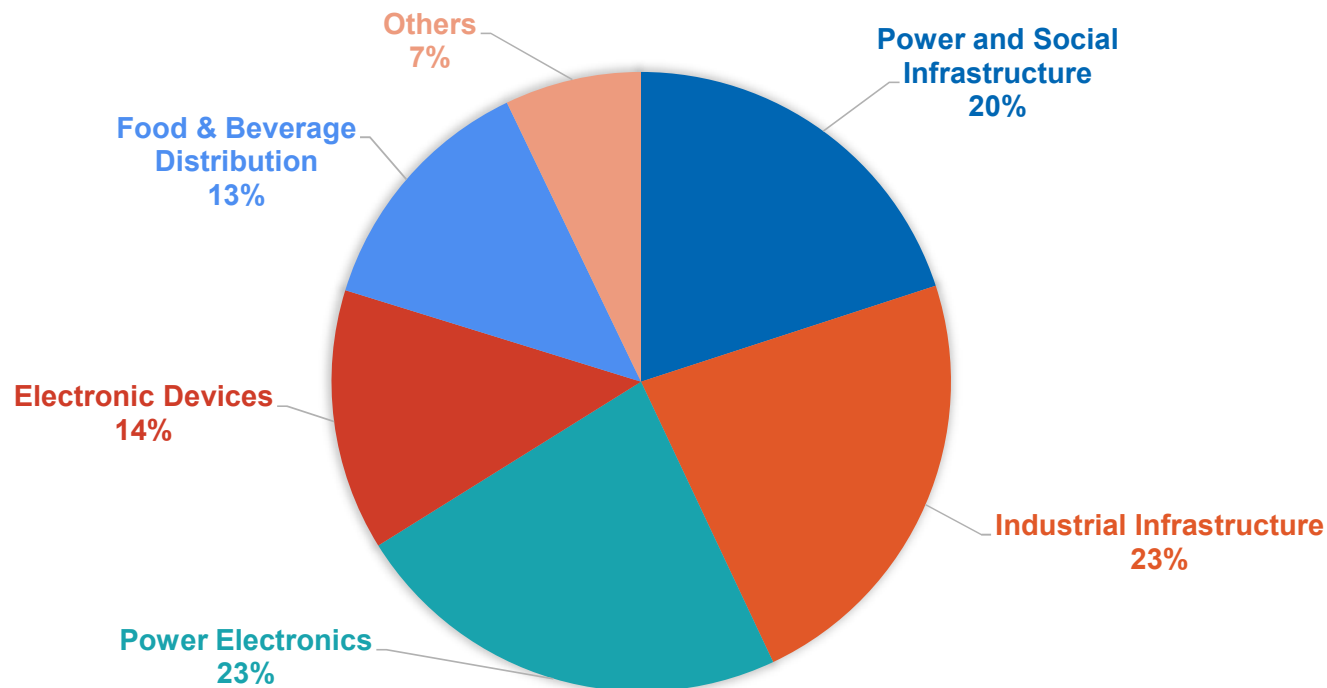
Innovating Energy Technology

**Through our pursuit of innovation
in electric and thermal energy technology,
we develop products that maximize energy efficiency and lead to a
responsible and sustainable society.**

Overview of Fuji Electric's Business



NET SALES 7.4 BILLION USD (FY2015) AS OF APRIL 2016



Our Global Presence



Our Commitment to Research & Development



Through innovations made in energy technology, Fuji Electric will create products that will help realize **a sustainable society**.

R&D Policy

- Expansion and enhancement of our core technologies, through the synergy of our fortes in power semiconductors and power electronics
- Expanding solutions technology that leverages unique sensor, control information and communications technologies.
- Promoting globalization of research and development and open innovation.

R&D Topic

- Promotion of Product Development through Open Innovation.



All-SiC module



Aerosol multi-analysis instrument

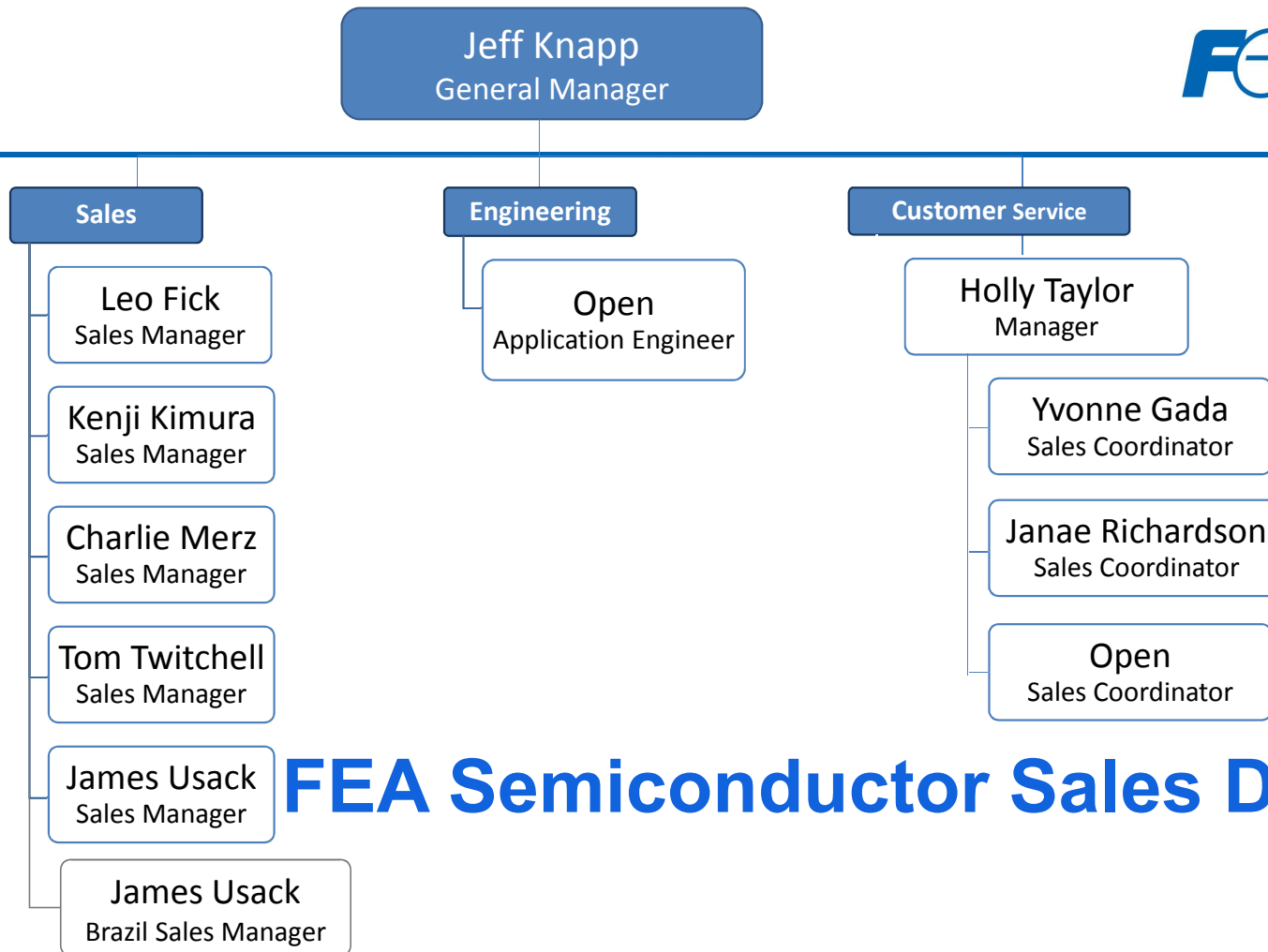


Fuji Electric Corp of America - FEA



- Headquartered at
50 Northfield Avenue,
Edison NJ 08837
- Established June 1, 1970
- 200 employees as of Jan. 2017





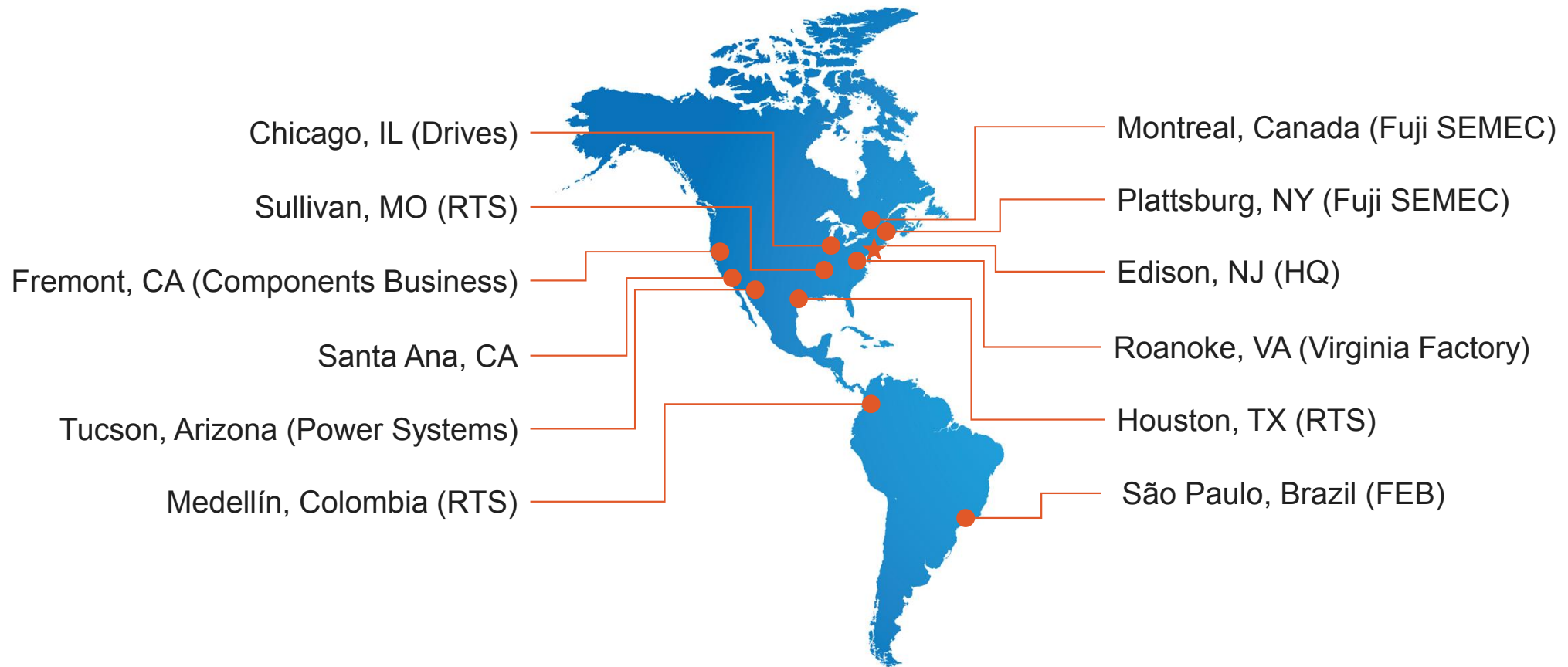
FEA Semiconductor Sales Department

FEA Company Structure



- President & CEO - Phil Charatz
- 14 Departments (Mini-Fuji Electric Japan)
- Responsible for Sales, Marketing, and Distribution of Fuji Electric's products in the Americas
- Established new manufacturing facility in Roanoke, VA in May 2015
- Acquired two companies to support manufacturing & services in 2015

Our Americas Locations





**Food &
Beverage**



**Distribution
& Control**



Drives



HMI



Instrumentation



Photoconductors

FEA Products

**Power
Generation**



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**Power
Supply**



**RC Blowers
& Pumps**



Semiconductors



**Transit
Systems**



UPS



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Fuji Electric - Electronic Devices



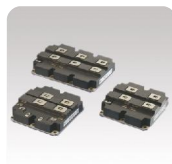
Across a wide spectrum of areas, including the industrial, new energy, and vehicle electrical components areas, we supply power semiconductors that save energy and improve efficiency. We also provide organic photoconductive drums that enable higher printing quality.

Power Semiconductors

Industrial and Alternative Energy Fields



All SiC modules



High-capacity IGBT modules

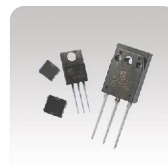


Advanced NPC3-level modules

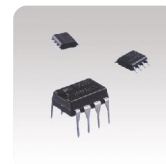


Industry Standard IGBT modules

Power Supply Field

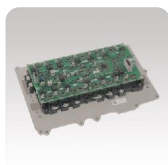


Power MOSFET



Power supply control IC

Automotive field



IPM* for hybrid electric vehicles



Pressure sensors

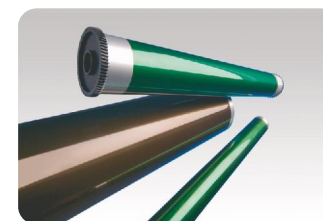
* IPM: Intelligent Power Module

Household Appliances Field



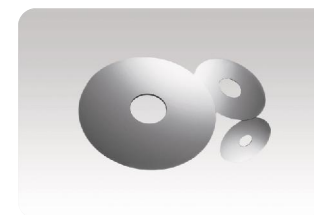
Small-capacity IPMS

Photoconductive Drums



Organic Photoconductive Drums

Disk Media



Magnetic recording media

FE - Food and Beverage Distribution Fuji Electric

In the food distribution field, we are helping to create a recycling-based society by providing total solutions that cover everything from the food production areas to the consumers. In these efforts, we utilize core heating and cooling technologies, mechatronic technologies, and system technologies in combination with information technologies.

Vending machines



Hybrid heat pump vending machine



General-purpose food vending machine



Coffee machines

Store & distribution



Next-generation cold storage container D-BOX



Freezer and refrigerated showcases



Energy management system



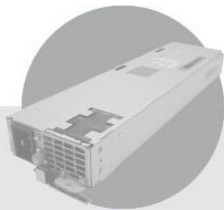
Automatic change dispenser



Environmentally friendly store (Ecolo panels)



Semiconductors

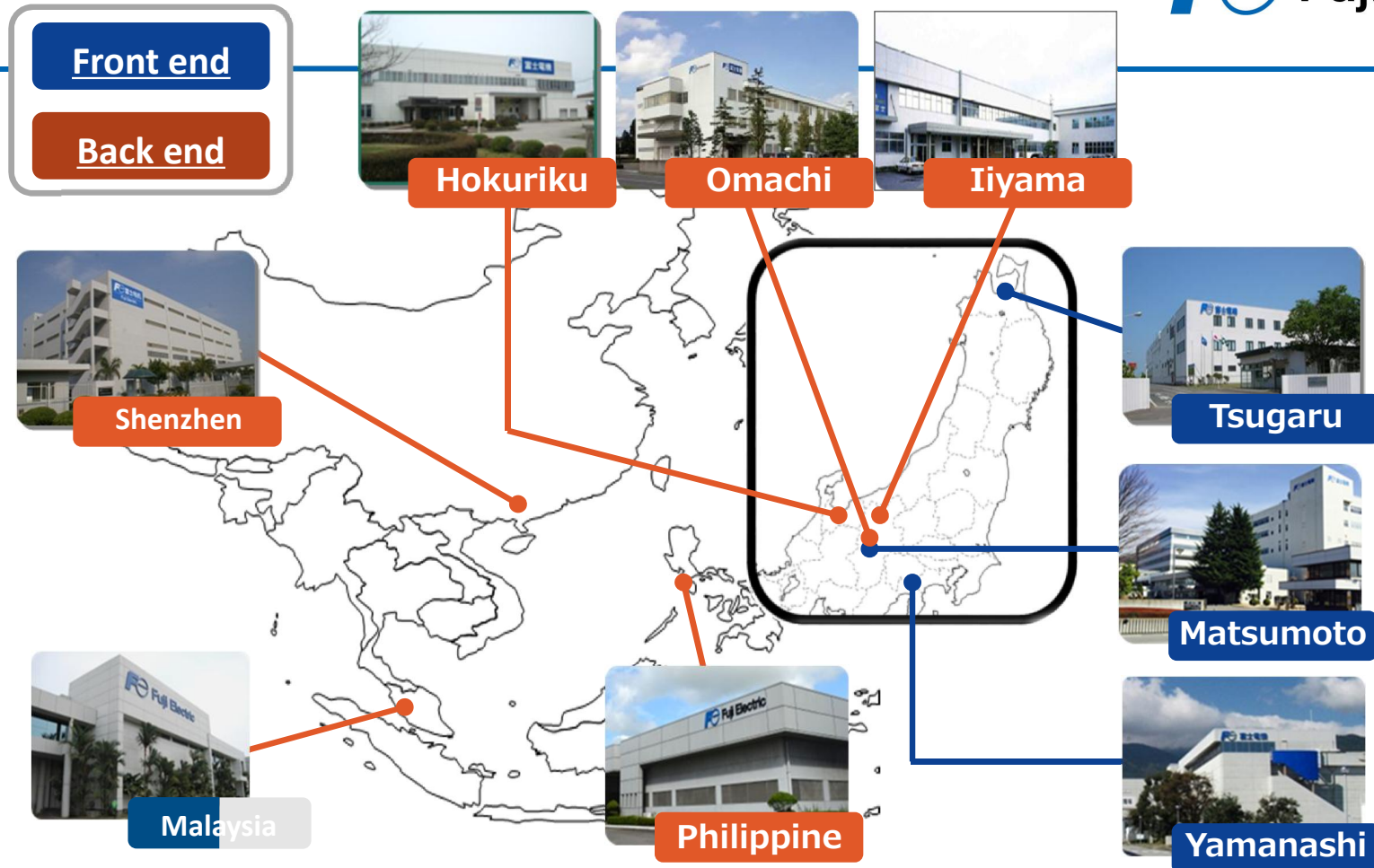


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Semiconductor Production Bases



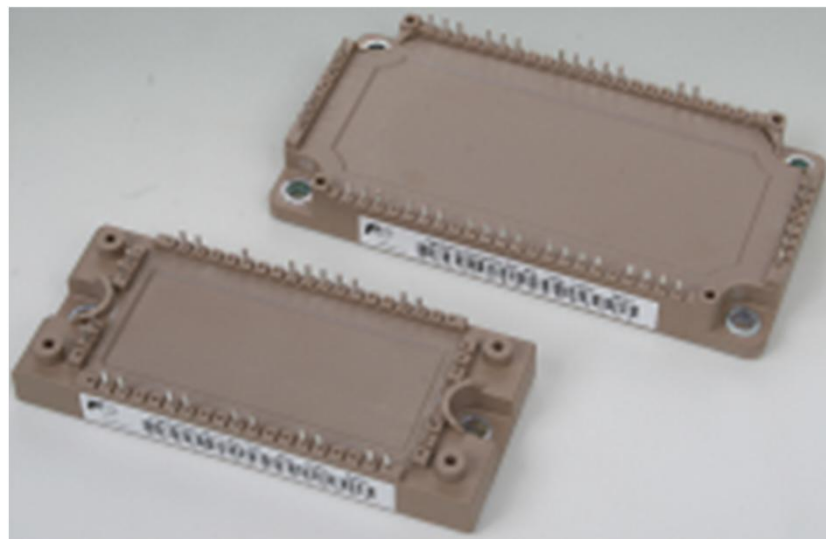
Semiconductor Sales Offices & Design Centers



- Industrial IGBT Power Modules
- High-Power IGBT Modules
- SiC Devices - Hybrid & Full SiC
- Discrete Rectifier Diodes
- Discrete Mosfet & IGBT Devices
- Automotive Modules
- Automotive Sensors
- TIM - Thermal Interface Material



Fuji Electric IGBT Modules



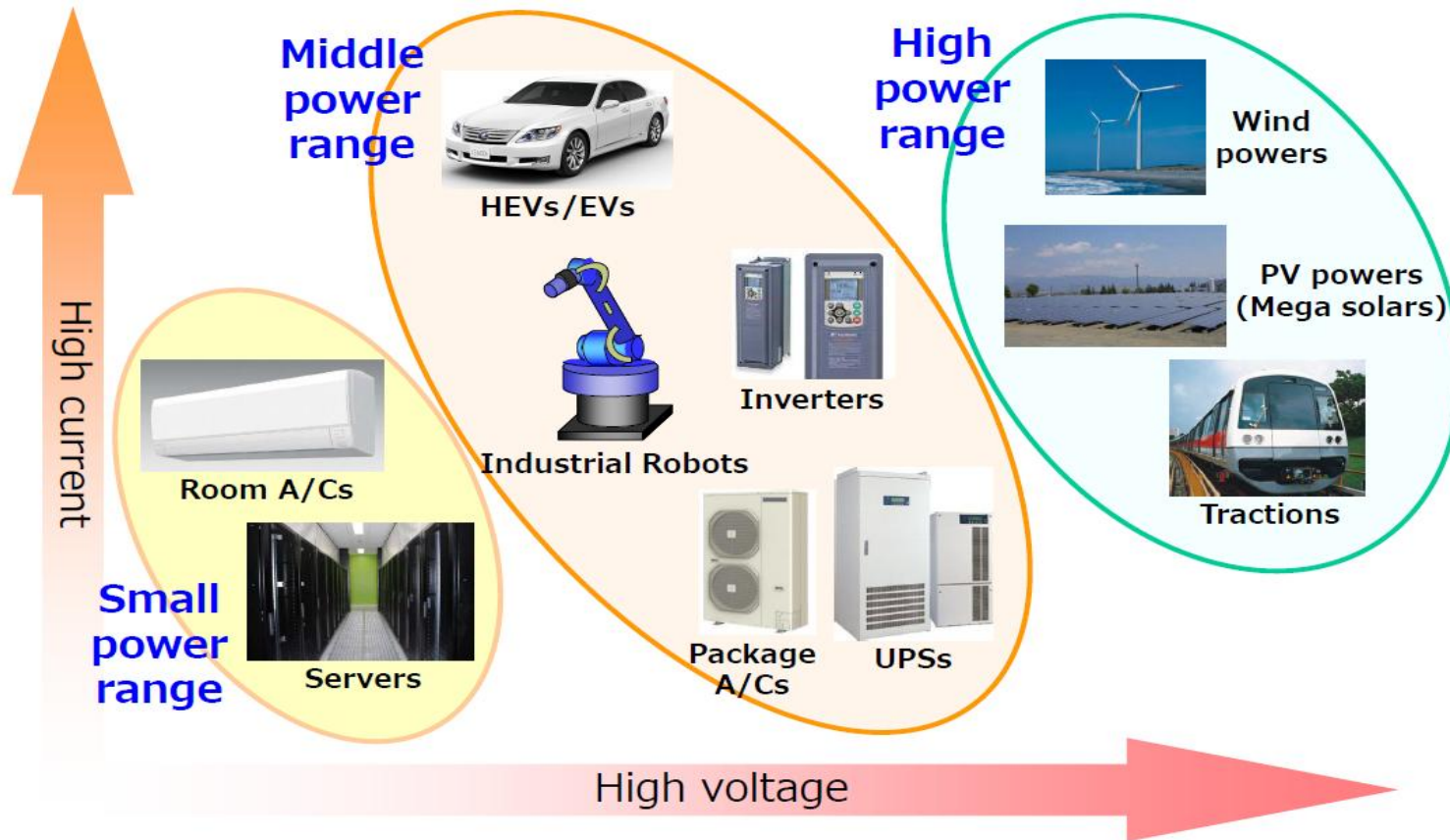
AC Motor

(Fan ▪ Pump ▪ Machine ▪ Elevator ▪ Air Conditioner ▪ Robot)

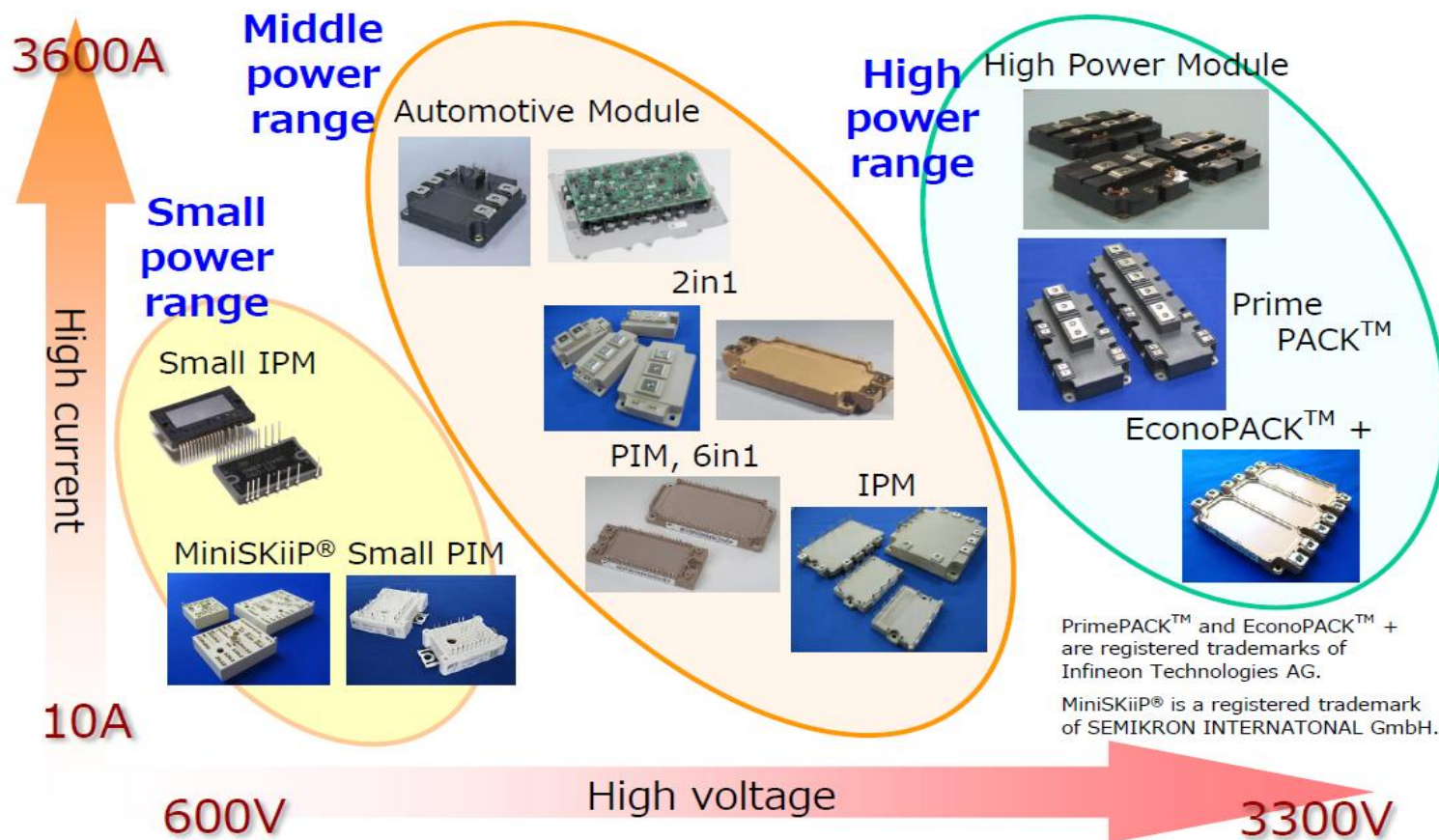
Power Conversion Equipment

(UPS ▪ Solar-Power Generation ▪ Wind-Power Generation)

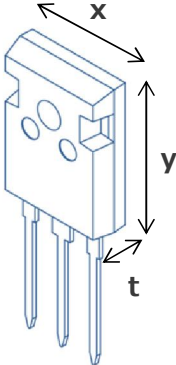
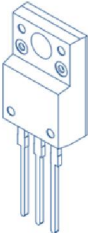
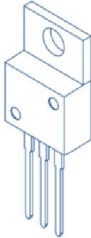
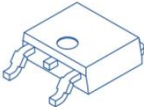
FE IGBT Modules - Target Markets



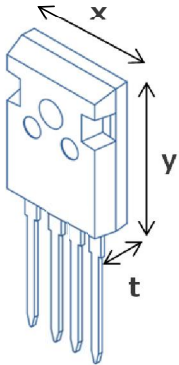
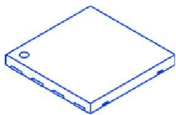
FE IGBT Modules - Product Line-Up



Super J MOS[®] : PKG Lineup

	TO-247	TO-220F	TO-220	TO-252
Outline				
x (mm)	15.9	10	10	6.5
y (mm)	20.95	15	15	5.5
t (mm)	5.03	4.5	4.5	2.3

Super J MOS[®] : New PKG Lineup plan

	TO-247-4 *	DFN 8x8 *
Outline		
x (mm)	15.9	8.0
y (mm)	20.95	8.0
t (mm)	5.03	0.85-1.0

*** Under Planning**

Main applications

Power Supply



SMPS for Ind. & Cons.
Telecom, Server,
LCDTV, LED, OA etc.

Industry



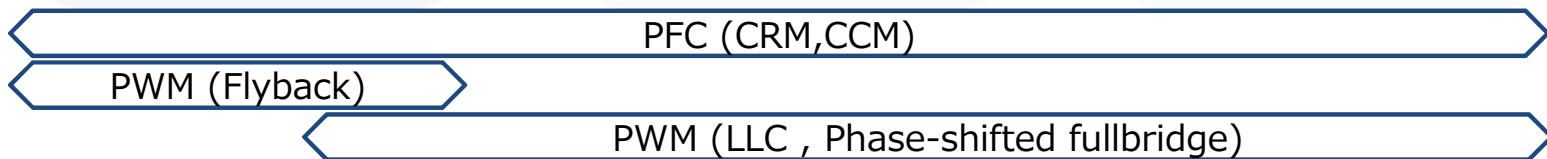
PCS, UPS,
Welding machine,
NC Machine,
Air conditioner etc.

Automotive



EV & P-HEV
Convertor(A/D,D/D)
AC-plug, EPS,
LED Lamp, etc.

Power stage for Super J MOS[®]



FEA Sales & Information Channels



- Manufacturers Representatives
- Distribution Channel Partners
- Direct OEM Accounts
- Internet Search Engine
- Fuji Electric Global Website
- FEA Website





Thank You

