Ferrotec Holdings Corporation

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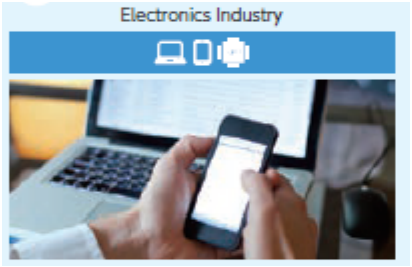
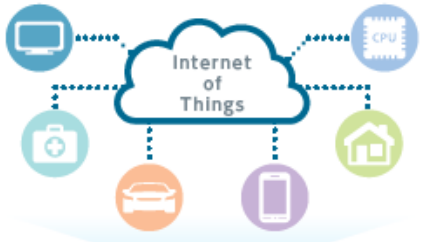
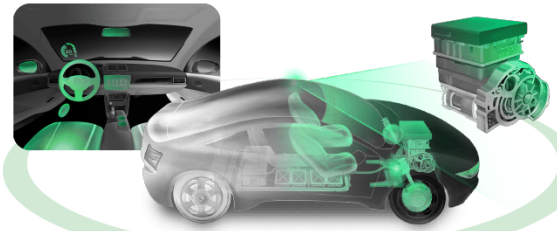
Business Strategy for the Second Quarter of FY3/21

Monday, November 30, 2020

Recognition of semiconductor market trends and domestic production in China

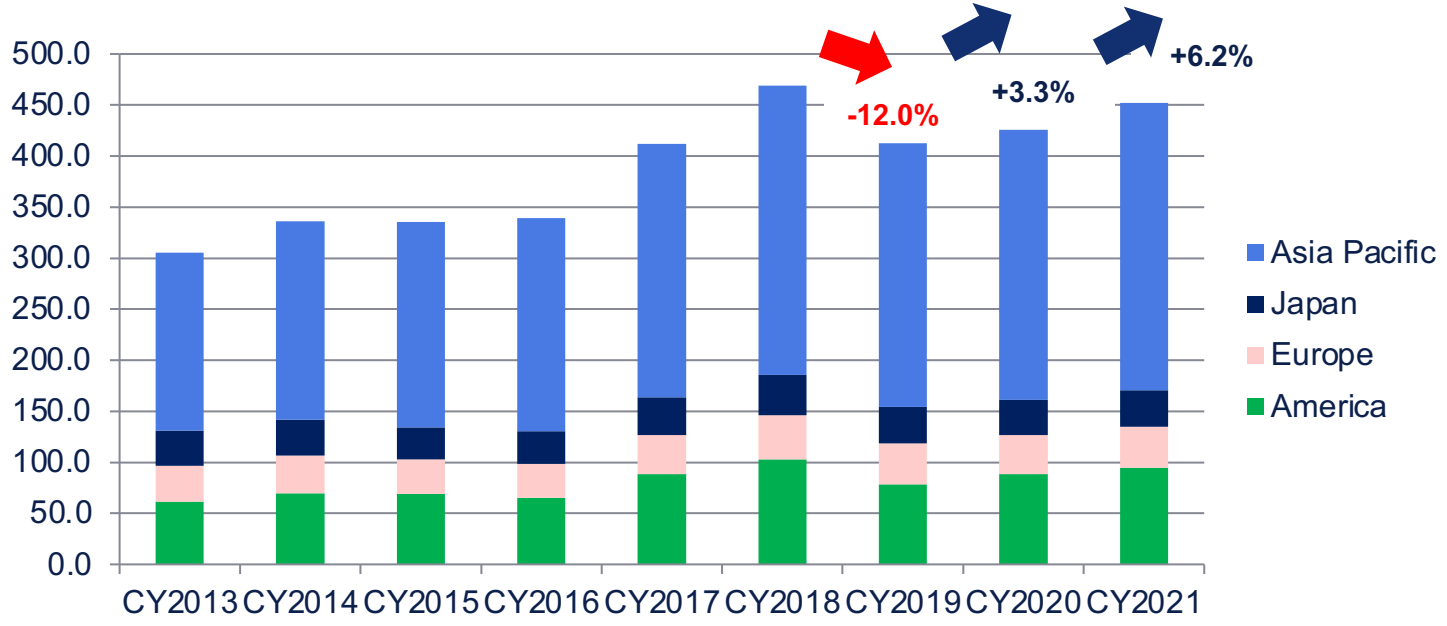






Semiconductor market forecast by region: Robust with 3.3% YoY increase in 2020 and 6.2% YoY increase in 2021

($US Billion)



	CY2013	CY2014	CY2015	CY2016	CY2017	CY2018	CY2019	CY2020	CY2021
Total IC	305.6	335.8	335.2	338.9	412.2	468.8	412.3	426.0	452.3
YoY growth (%)	4.8%	9.9%	-0.2%	1.1%	21.6%	13.7%	-12.0%	3.3%	6.2%

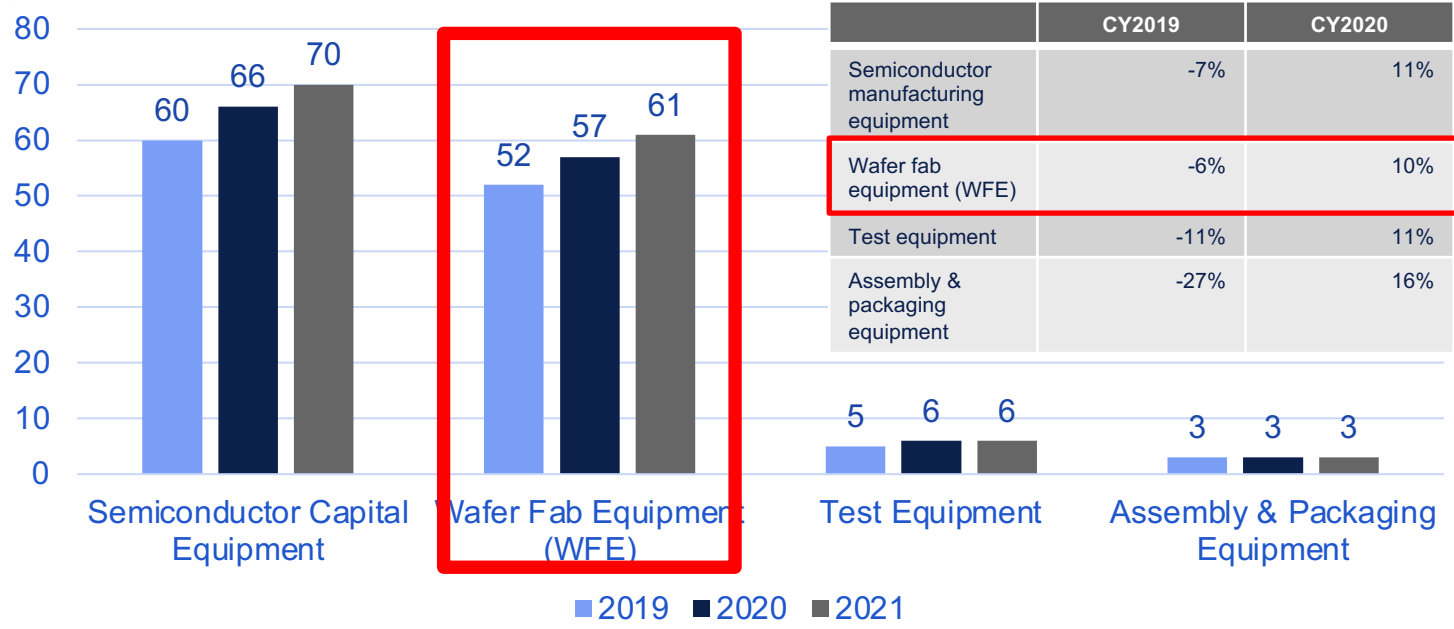
*Prepared by us based on data published by the WSTS Japan Council (June 9, 2008).
*CY = calendar year (CY2013 = 2013)

Semiconductor manufacturing equipment market: The scale of the WFE market is estimated to grow 10% in 2020 and 6% in 2021

The growth rate of the WFE (Wafer Fab Equipment) market is forecast to be positive in 2020 and 2021 against the backdrop of strong semiconductor market conditions.

Results and Forecast for Semiconductor Manufacturing Equipment Market (2019-2021)

($US Billion)



Year-on-year growth rate (2019-2021)

	CY2019	CY2020	CY2021
Semiconductor manufacturing equipment	-7%	11%	6%
Wafer fab equipment (WFE)	-6%	10%	6%
Test equipment	-11%	11%	5%
Assembly & packaging equipment	-27%	16%	2%

Prepared by our company based on the data released by SEMI (September 2020)
***CY = calendar year (CY2019 = 2019)**

Domestic production in the high-tech field will accelerate further in China

◇Main items determined by the 5th Plenary Session of the 19th Central Committee of the Chinese Communist Party: Held on October 2020

◉14th 5-year plan

- Independent development of science and technology serves as a national growth strategy with technological innovation playing the pivotal role in modernizing the country.
- Focus on strengthening production capability, improving quality, enhancing Internet literacy and building digital-oriented country.

◉Long-term plan until 2035

- Achieve exponential progress in economy, science and technology, and comprehensive national power to become the most advanced innovation-oriented country.
- Elevate the level of per capita GDP to the one of mid-level advanced countries.

Domains emphasized in the construction of new infrastructure in China

AI

IoT

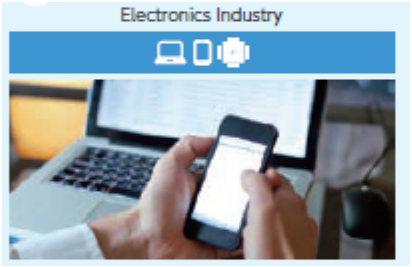
5G

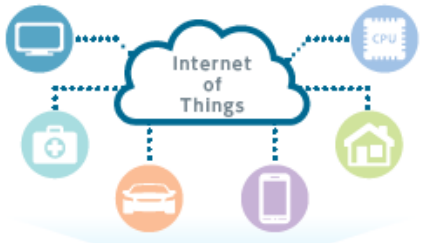
Block chain

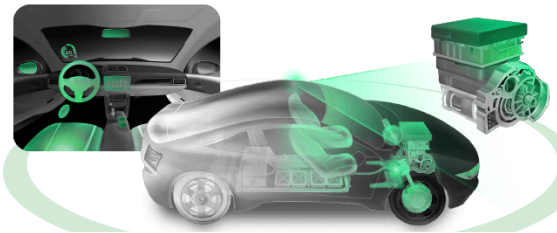
Data centers

Etc.

Future business strategies







Recent management situation and future business strategy

Business Results

Results for the first half of FY3/21 were higher than expected. The plan for the full year is unchanged.

Due to strong demand for semiconductors, the performance in the first half was higher than expected. The full-year plan remains unchanged (US-China friction, scrutiny of the impact of subsidiary restructuring, etc.)

Restructuring

Restructuring of Chinese subsidiaries and listing of subsidiaries

Promoting the establishment of joint ventures with Chinese government and private funds. Preparation for listing parts cleaning and semiconductor wafer subsidiaries in China

Capital Policy

Improving the Group's financial position and utilizing Chinese capital

Reducing the Group's interest-bearing debt and promoting capital procurement in China

Capital Investment

Examination of priorities for capital investment from FY3/22

Continue to increase production capacity for material products, cleaning, power substrates, etc., which are in strong demand

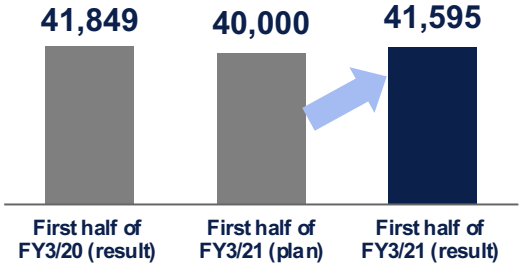
Examining semiconductor wafers, recycled wafers, and SiC single crystals based on market trends and the status of capital procurement in China

Earnings forecast for FY3/21: Higher than expected in the first half due to strong semiconductor market (the full-year plan unchanged)

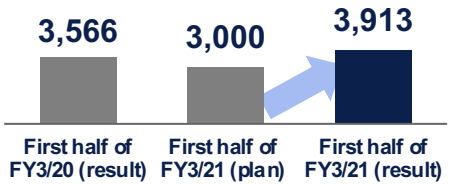
The performance in the cumulative second quarter (first half) of FY3/21 exceeds the estimate.

<Amount: Million yen>

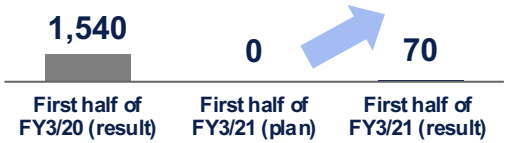
Net sales: +3.9% from the estimate



Operating income: +30.4% from the estimate



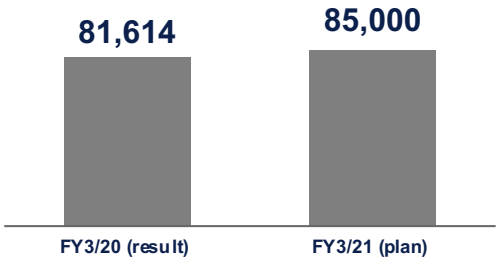
Net income posted positive



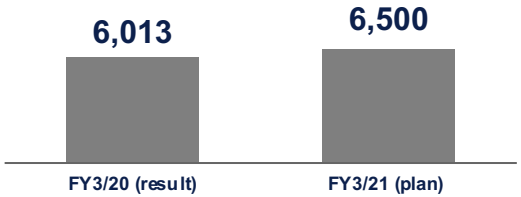
The full-year plan for FY3/21 remains unchanged from the initial plan as of Aug. 14.

*Scrutiny of the impact of restructuring of Chinese subsidiaries in the future

Net sales



Operating income



Net income

Items on which the Group puts importance in the business in China

Intensive points

What is "Made in China 2025?"

This is a national project announced by the Chinese government in May 2015, and corresponds to the 1st stage of the project for strengthening domestic manufacturing, which is scheduled to end in 2049.

→The Chinese manufacturing industry aims to shift from the advantage in quantity to the advantage in quality, by overcoming the shortage of innovation capacity.

1. Participation in national projects in the semiconductor field

★Utilization of national and provincial technological centers and preferential measures based on national projects

★Pursuit of the cutting-edge technologies and products that cannot be imitated by Chinese enterprises

2. Planning for restructuring the group of Chinese subsidiaries and procurement of funds for growth

★Discussion on the establishment of a holding company that manages multiple Chinese subsidiaries and its functions

★Clarification of cutting-edge technologies and businesses to grow and to be strengthened and diversification of schemes for procurement of funds for growth

Outlook for 2020

Domestic production of semiconductors

Equipment: 30%

Material: 50%

For further domestic production

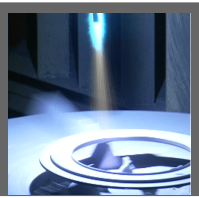
The Chinese government is expected to enhance preferential measures.

To further engage in the growing business, by actively utilizing Chinese external capital

Promoting capital procurement in China for growth funds by accepting investments by the Chinese government and private funds (joint ventures)

Semiconductor silicon wafer subsidiary (Hangzhou City, Zhejiang Province)

- Group's shareholding ratio: 29.5% (as of the end of October 2020: after a third-party allotment)
- We plan to consider investing for increasing production of 12-inch wafers. We are planning to list it on the Shanghai or Shenzhen market in the future.



Equipment parts cleaning subsidiary (Tongling City, Anhui Province)

- Group's shareholding ratio: 67.0% (as of the end of October 2020) * We have secured a majority of shares.
- In response to China's domestic production policy, we will continue increasing the production capacity of this business. We are preparing to list it on the STAR Market.

Semiconductor wafer recycling subsidiary (Tongling City, Anhui Province)

- Group's shareholding ratio: 41.3% (as of the end of October 2020: after a third-party allotment)
- We plan to start mass production in 2Q (April-June) of 2021. We are discussing monthly production of 120,000 wafers in Phase 1 and then 200,000 wafers.

SiC (Silicon Carbide) single crystal ingot wafer subsidiary (Tongling City, Anhui Province)

- Group's shareholding ratio: 31.5% (when the subsidiary was established in October 2020)
- The company established a joint venture with the Shanghai Institute of Ceramics, Chinese Academy of Sciences and government and private funds. We will work on joint development and manufacturing of SiC single crystals as a new business.

Outline of the Chinese stock market and Science and Technology Innovation Board (STAR Market)

Science and Technology Innovation Board (STAR Market)

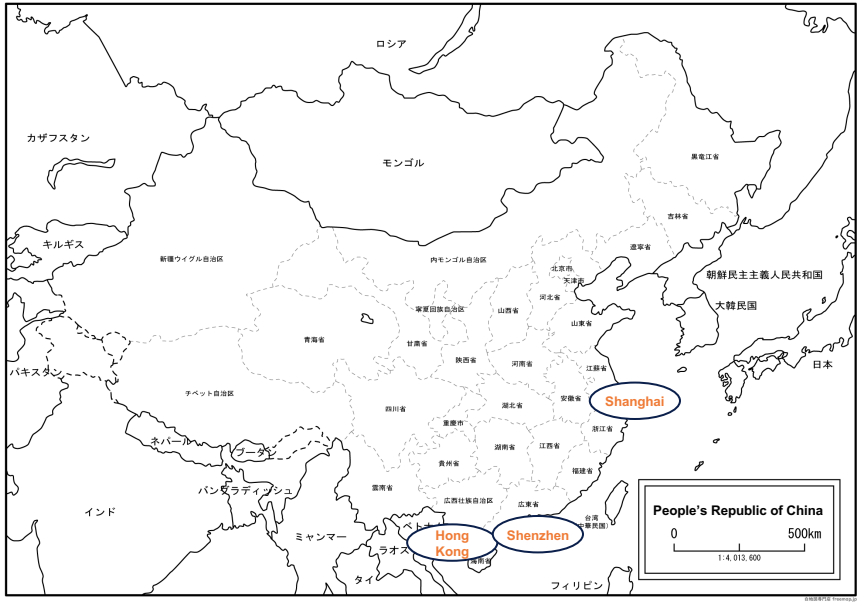
*Preparations are ongoing to list the subsidiary in Tongling City, Anhui Province, which engages in equipment parts cleaning, on the STAR Market.
The subsidiary in Dongtai City, Jiangsu Province, which produces power semiconductor substrates, will also be listed on the same stock exchange.

Science and Technology Innovation Board (STAR Market) is a new stock market in Shanghai, China and is called as Chinese NASDAQ. STAR Market is for start-up companies, mainly for ones engaging in high technology, and transaction started on July 22, 2019. At the first initial public offering, 25 companies were listed. As of September 30, 2020, 183 companies are listed and its aggregate market price is 2,875.3 billion yuan.

Outline of the Chinese stock market

Source: Created with reference to the data from Hong Kong Stock Exchange and Shenzhen Stock Exchange
*The following contents are as of September 30, 2020.

Market			No. of listed companies	Aggregate market price
Hong Kong Stock Exchange	Main board		2,143	41,327 billion HKD
	GEM		375	108 billion HKD
Shanghai Stock Exchange	A-Share	Main board	1,374	35,547.7 billion yuan
		STAR Market	183	2,875.3 billion yuan
	B-Share	Main board	49	75 billion yuan
Shenzhen Stock Exchange	A-Share	Main board	460	8,594.4 billion yuan
		SME Board	976	12,674.7 billion yuan
		ChiNext	865	9,478.6 billion yuan
	B-Share	Main board	45	47.9 billion yuan



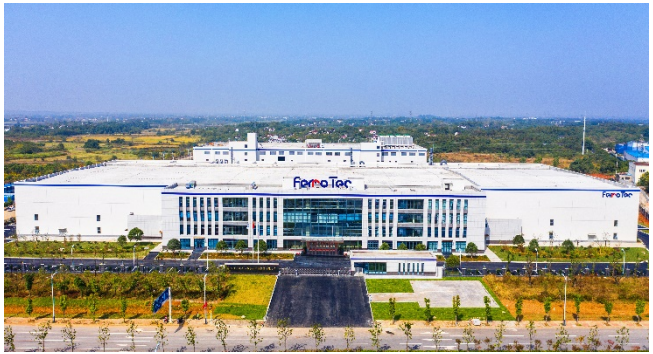
Wafer recycling: To expand production capacity in Phase 1 and increase capital through third-party allotment

✦To use the resources of the wafer business and the know-how of the cleaning business. Technical tie-up with partners for the film removal process

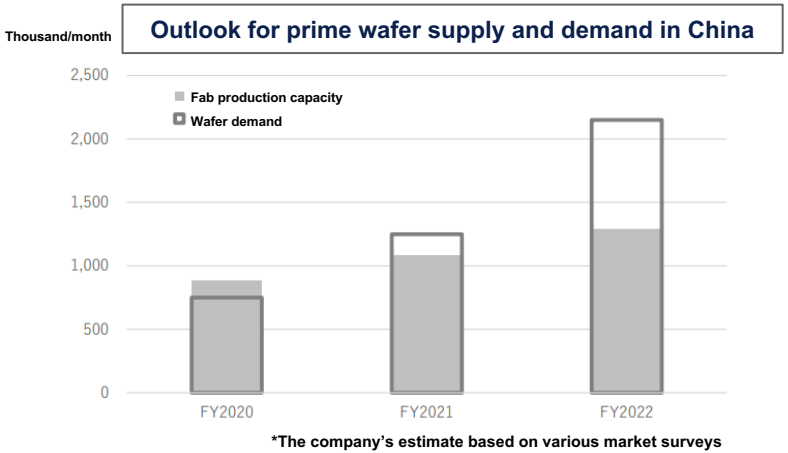
Future schedule (tentative): Construction is scheduled to be completed in November 2020, **start trial operation in 1Q (January-March) of 2021 and proceed to mass production in 2Q (April-June) of 2021**

✦**Due to the acceleration of domestic production of semiconductors in China,** the demand for wafer recycling rose sharply. We increased monthly production capacity from 65,000 to **120,000 wafers** in Phase 1 (investment: 7.85 billion yen to **14.02 billion yen**) to meet strong customer demand for mainly 12-inch wafers.

✦**Capital increase through third-party allotment: At the end of October 2020, a capital increase of 6.3 billion yen (410 million yuan) was implemented, and the capital (after the capital increase) of the wafer recycling subsidiary "Ferrotec (Anhui) Changjiang Semiconductor Material Co., Ltd." rose to 19 billion yen (1.23 billion yuan)**
<The shareholding ratio of the Group has decreased from 70.0% to 41.3%. *The investment ratio of multiple government funds has risen.>



Wafer recycling factory built in Tongling City, Anhui Province



***The company's estimate based on various market surveys**

Launched the SiC (Silicon Carbide) business as a joint venture with the Chinese Academy of Sciences and government and private funds

✦We established a joint venture with the Shanghai Institute of Ceramics, Chinese Academy of Sciences (SICCAS) and government and private funds in Tongling City, Anhui Province in October 2020 (Group's investment ratio: 31.5%). We will develop and manufacture SiC (silicon carbide) single crystal ingots and wafers, whose market is expected to grow as they will be used for the most advanced semiconductors (◉ third generation semiconductors) in China.
***We plan to complete construction, deliver equipment, and start trial production by the end of 2021.**

■Technical issues of SiC (silicon carbide) single crystal

-High technical difficulty in crystal growth (larger diameter), substrate production, electrical characteristic control, and crystal defect control. Hence, some companies in Europe, the United States, and Japan have achieved mass production. In China, it is a strategic technology in order to achieve domestic production amid increasing domestic demand for electric vehicles.

■ Backgrounds for working on the business as a joint venture

(1) Our group: Defect control technology and equipment manufacturing technology cultivated in the semiconductor Si single crystal business. Possession of knowledge and the customer base for SiC through the CVD-SiC (jig for semiconductor manufacturing equipment) business.

(2) SICCAS: China's top SiC research institute. Possession of intellectual property and human resources

(3) Financing: Government and private funds and government subsidy support

■ Main applications of SiC (silicon carbide) single crystals

-SiC is increasingly used in in-vehicle applications for chargers and DC converters for electric vehicles because of its "low switching loss and electric loss" and "resistance to temperature changes."

◉ What is a third generation semiconductor?

・It refers to semiconductors composed of new materials, such as silicon carbide (SiC), gallium nitride (GaN), zinc oxide (ZnO), and graphite (C). It can be operated at a higher voltage, frequency, and temperature than first-generation semiconductors (such as silicon) and second-generation semiconductors (such as gallium arsenide).

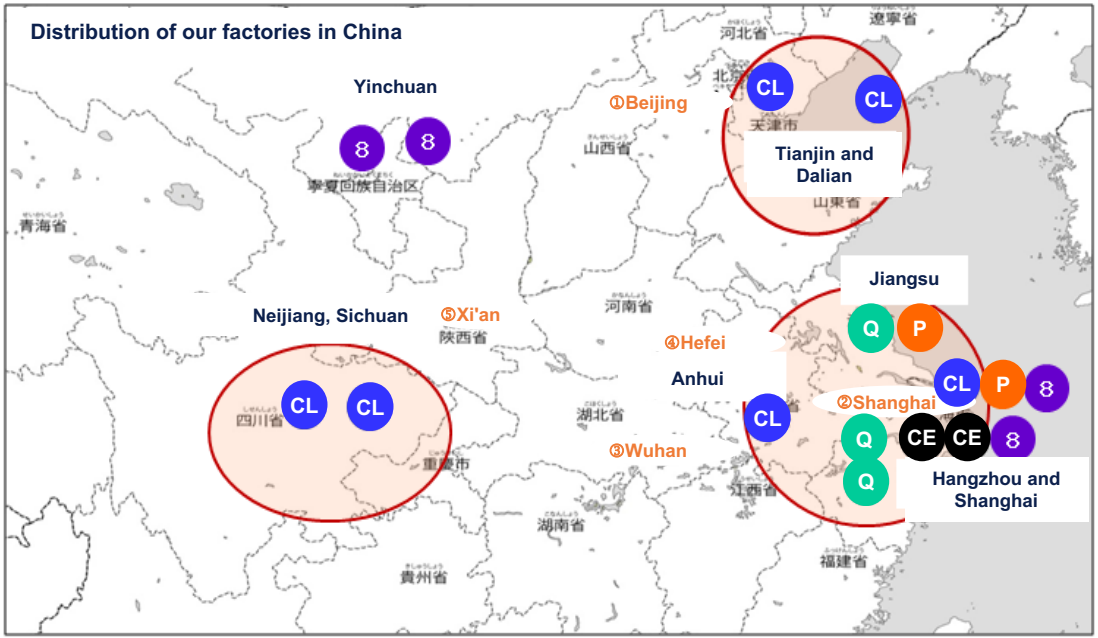
・It is expected to be a semiconductor used for RF (radio frequency) parts used in 5G (fifth generation mobile communication system), high-efficiency diodes, LEDs (light emitting diodes), etc. It is predicted to be used in new energy vehicles, white goods, railroad transportation, medical equipment, etc.

Map of production bases of Ferrotec Group in China

We will contribute to the growth of the market assuming domestic production and expand business by establishing production bases in the vicinity of major footholds of Chinese semiconductor enterprises and improving customer satisfaction.

★Major footholds of Chinese semiconductor enterprises

①Beijing ②Shanghai ③Wuhan ④Hefei ⑤Xi'an



= Major industrial area

= Semiconductor wafer (Shanghai, Yinchuan×2, Hangzhou)

= Quarts factory (Hangzhou, Changshan, Dongtai)

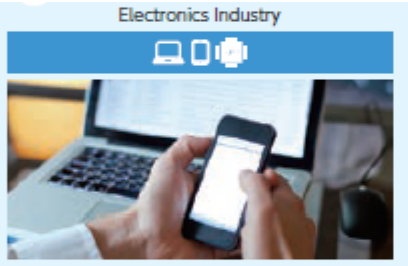
= Ceramics factory (Hangzhou×2)

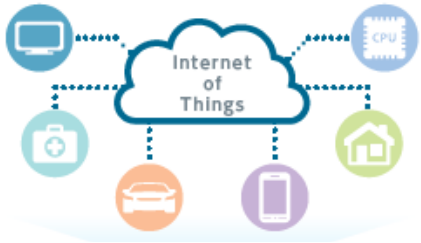
= Cleaning factory (Shanghai, Tianjin, Sichuan×2, Dalian and Anhui province)

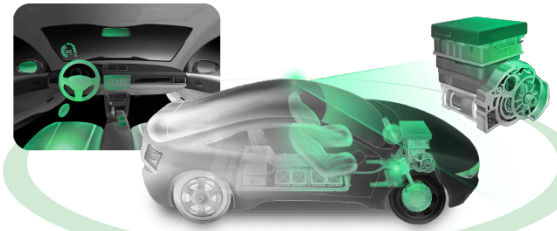
= Power semiconductor substrates (Shanghai, Dongtai)

***Recycling of wafers and production of SiC (silicon carbide) wafers will start in Tongling, Anhui Province in 2021.**

Semiconductor equipment-related business: Recent situation of main products







Our lineup of semiconductor-related products

Vacuum feedthroughs

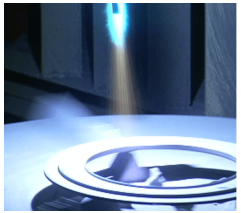
*Semiconductor and FPD production equipment parts (Market share: 65% (largest))

★Strategic product

Silicon wafers

*Monthly production capacity- 6-inch: 400 thousand, 8-inch: 100 thousand
Plan to increase production of 8 inches by 350 thousand sheets and 12 inches by 30 thousand sheets over the medium term

★Strategic product



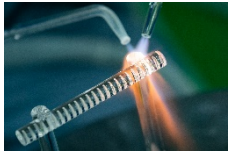
Equipment parts cleaning

*Focus on the Chinese market (Market share in China: 60% (largest))

Metal precision machining

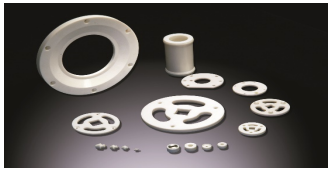
*Growth forecast due to increase in future customers (factories) in China

Jigs and consumables for semiconductor manufacturing equipment (our mainstay material products) ★Strategic product



Quartz

Silicon parts



Ceramics

CVD-SiC

Our strengths: Not only capital investment-linked products (vacuum feedthroughs), but also a lineup of repeat consumables (materials) and services (equipment parts cleaning) linked to the production and operation of semiconductor device manufacturers

Wafer business: Partially transferred shares of a subsidiary in Hangzhou, Zhejiang, China, and increased capital

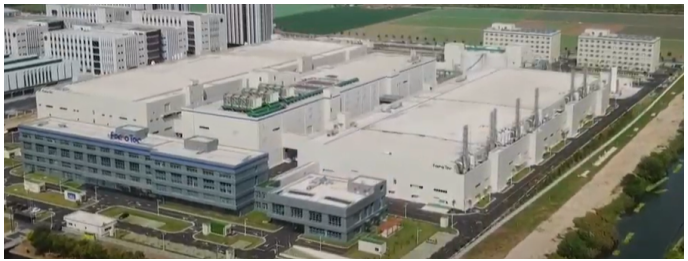
✦Partial transfer of shares of the semiconductor wafer subsidiary (FTHW): Raised 1.97 billion yuan (about 30.3 billion yen)
<Our company holds 40% of shares>

✦FTHW's capital increase through third-party allotment: Raised 1.6 billion yuan (approximately 24.6 billion yen) *Implemented in October 2020
<Our company holds 29.5% of shares>

■ Background and purpose of partial transfer of shares

- ✓ **China's capital market has become more active against the backdrop of expanding domestic production in the Chinese high-tech field. We raised capital through transfer of the company's shares and third-party allotment as the acquisition of certification for the company's 12-inch wafer progressed.**
- ✓ **Although the company is making progress with the acquisition of the 12-inch semiconductor wafer certification, we are at the stage of upfront investment.**
- ✓ **Large-scale investment in the wafer business has expanded assets and interest-bearing debt.**
- ✓ **The company decided to partially transfer the shares in order to secure a balance between business/investment opportunities and finance.**

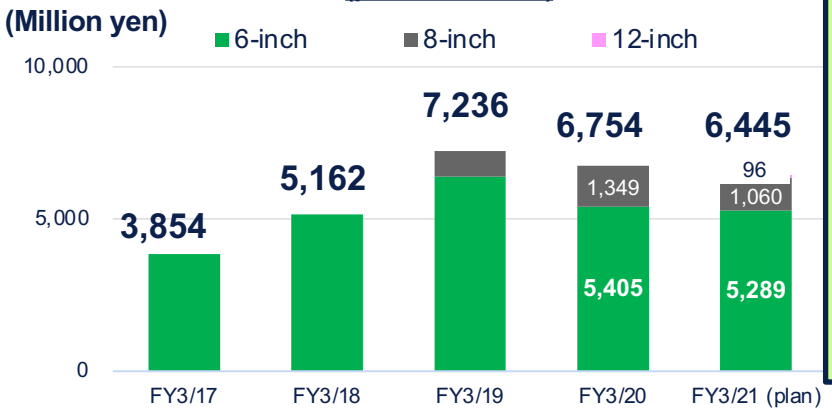
Semiconductor wafer processing factory in Hangzhou City, Zhejiang Province



Recent situation of product: Semiconductor wafer

Semiconductor wafers

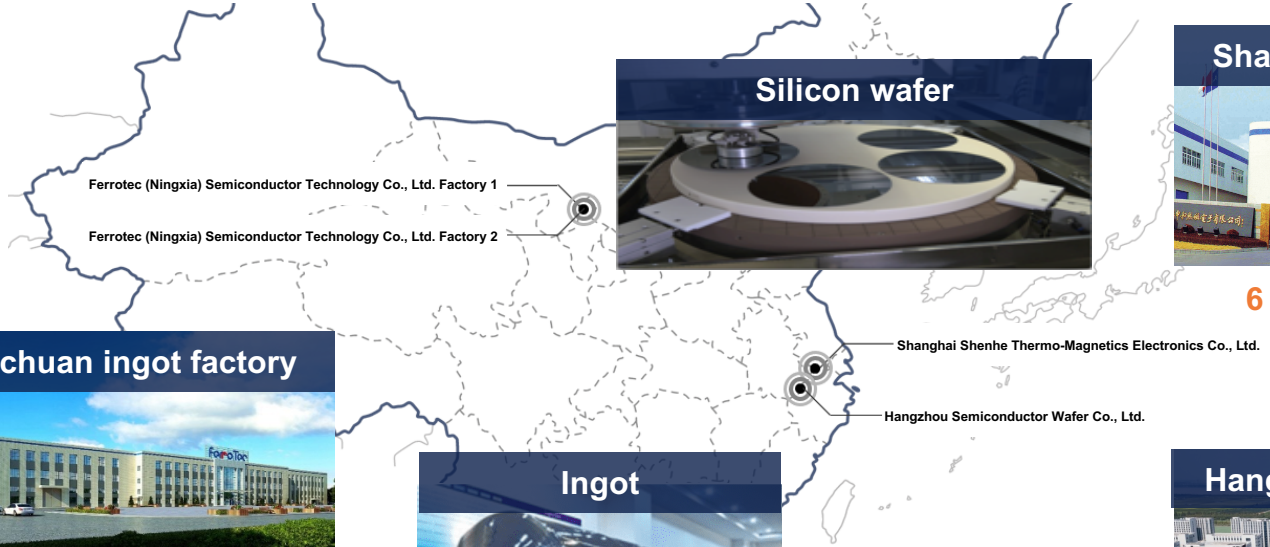
Variations in sales from FY3/17 to FY3/21 (plan for FY3/21)



- **In 2020,** annual sales are expected to decline due to the softening of demand for consumer power devices and automobiles in the first half of the year.
- Demand for **6-inch wafers** is currently strong, and **monthly production of 420,000 wafers is maintained.**
- **We are strengthening the direct sales system of 8-inch wafers** and promoting customer accreditation at the new Hangzhou factory. At the end of this fiscal year, we will have a monthly production of 100,000 wafers. **We will build a production increase system to meet the demand from 2021.**
- **Mass production of 12-inch wafers is forecasted to start** in 4Q (October-December) (monthly production of 30,000 wafers). We will consider additional capital investment in the future on the premise of raising funds in China, such as a capital increase through third-party allotment.

Map of production bases for semiconductor wafers in China

- We are making 8-inch and 12-inch wafers of the factory in Hangzhou approved and increasing mass-production for acquiring new customers.



Silicon wafer

Shanghai wafer factory

6 and 8-inch wafers

Yinchuan ingot factory

6, 8, and 12-inch wafers

Ingot

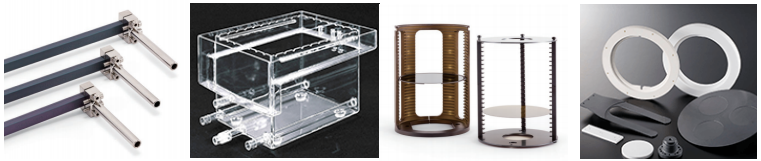
Hangzhou wafer factory

8 and 12-inch wafers

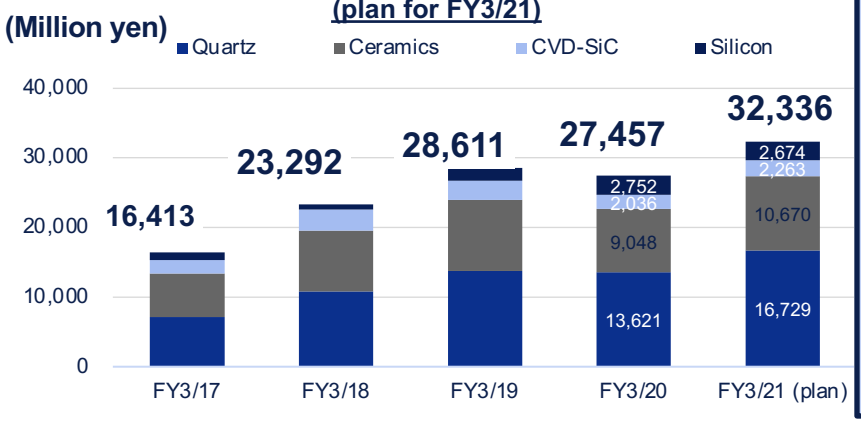
Recent situation of product: Semiconductor material

***The target products are quartz, ceramics, CVD-SiC, and silicon.**

Semiconductor materials



Variations in sales from FY3/17 to FY3/21 (plan for FY3/21)



- In the FY3/21 plan, we expect to increase sales by 11.1% year on year.
  *The semiconductor market remains robust due to increased demand for 5G and data centers related to telecommuting.
- As for semiconductor materials, **the demand for consumable materials is strong,** so the ratio of linkage to the **production operation rate** of semiconductor manufacturers is high (some are **investment-linked ones**).
- The WFE (Wafer Fab Equipment) semiconductor front-end manufacturing equipment market is expected to grow year on year in 2021 and 2022, so we plan to respond to increased demand for **material products by raising production capacity as needed**.

Products: To keep enhancing the capacity to produce quartz products

- Among materials, the sales of quartz are projected to grow steadily (as the demand for consumable materials is firm). *Semiconductor manufacturing equipment market will see year-on-year growth in 2021 and 2022.
- We established a system for increasing production output with factories in Hangzhou and Changshan, Zhejiang and Dongtai, Jiangsu, China, and Yamagata City, Japan.

Map of factories for quartz in Japan and China

Pyro-processing of quartz by veteran engineers

Machining of quartz, whose production amount will be increased

Products: To expand business based on the capability of developing ceramics and CVD-SiC

- As for ceramics and CVD-SiC, we have the advantage in developing “materials and technologies for processing and coating” in Japan. Machinable ceramics for laser processing probe card will be strengthened (added value).
- Hangzhou Factory in Zhejiang, China plans to enhance the capacity to produce fine ceramics, which are in high demand.

Hyogo: Development and mass-production of fine ceramics

Hangzhou in China: Mass-production of fine ceramics

Fine Ceramics

- Alumina
- Silicone nitride
- Silicon carbide
- Aluminum nitride
- Zirconia
- Low thermal expansion

Ishikawa: Mass-production of machinable ceramics

Machinable Ceramics

- Mica-based machinable
- Nitride-based machinable
- Introduction of processing technology

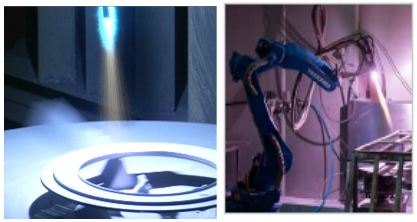
Ishikawa: Development of fine and machinable ceramics

CVD-SiC

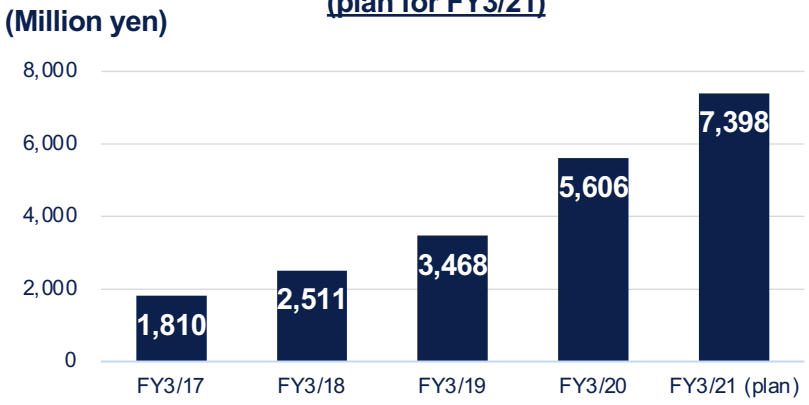
- Silicon carbide

Okayama: Development and mass-production of CVD-SiC

Equipment parts cleaning



Variations in sales from FY3/17 to FY3/21 (plan for FY3/21)



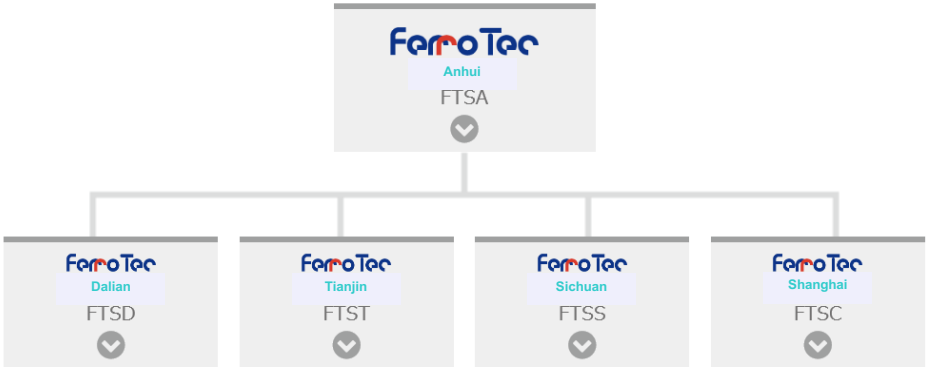
- In the FY3/21 plan, sales are projected to increase 32.0% year on year.
- **This business is targeted at the Chinese market.** Its scale has been growing steadily year by year, in response to the expansion of production by **semiconductor and FPD (organic EL and liquid crystal) manufacturers.**
- Since this business is **a recurring-revenue type that depends on clients' production operation,** like semiconductor materials, we can readily secure stable sales (**the business is expected to keep growing steadily**).
- Since we are increasing the cleaning volume with 5 bases and 6 factories, **our market share in China is approaching 60%.**

Strategic Products: We plan to expand the equipment parts cleaning mainly in Tongling, Anhui

- The governmental fund of Tongling, Anhui will co-invest, and we aim to realize a project for expanding the business.
- Since Chinese semiconductor and FPD makers will launch new projects one after another, we plan to increase the cleaning volume in Tongling.

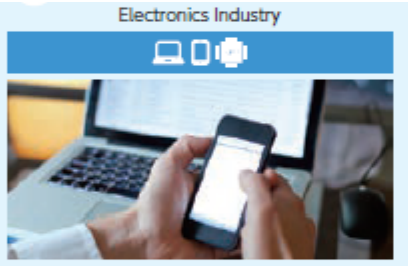
★For the equipment parts cleaning, we restructured our organization with the factory in Tongling, Anhui controlling the other factories.

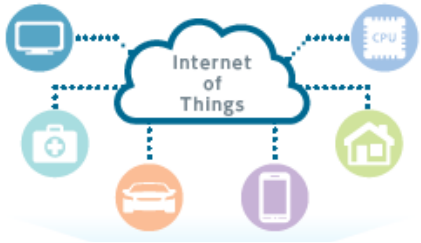
As mentioned above, preparations have begun to list the subsidiary in Tongling, Anhui Province, on the STAR Market.

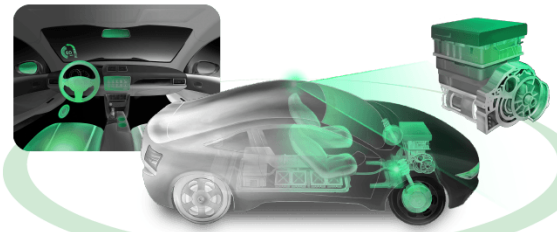


★To offer meticulous services in the vicinity of client facilities (5 bases and 6 factories)

Electronic device segment: Recent situation of product

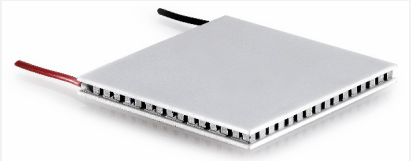






Lineup of our electronic device-related products

Thermo-electric modules

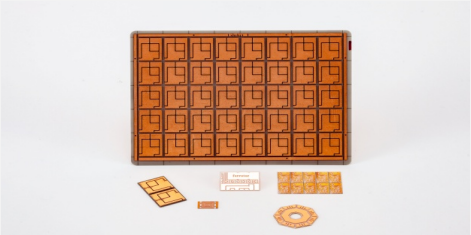


*As temperature adjustment devices, thermo-electric modules are increasingly used in the fields of automobiles, semiconductor manufacturing equipment, communications, medical biotechnology, consumer products, etc.
(Market share: 36% (largest))

DNA amplification (bio)
To check the existence of pathogens that cannot be observed with a microscope <PCR method>

*Polymerase Chain Reaction

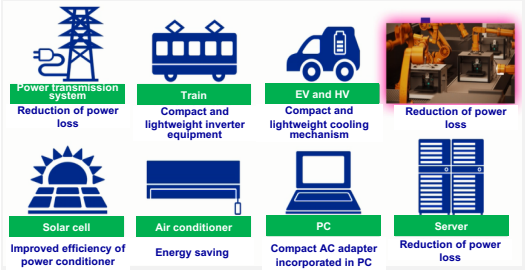
Power semiconductor substrates



★Strategic product

*In response to the global trend of power consumption reduction, the demand from clients needing power semiconductors is growing.
(DIRECT COPPER BONDING technology for bonding a cooper circuit to an aluminum ceramics substrate)

Application of power semiconductors



Ferrofluid

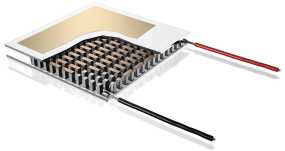
*Used in a wider range of fields, including automobile speakers, high quality sound TV speakers, and smartphone vibration
(Market share: 80% (largest))

Adopted for high-quality sound headphones

*To stabilize vibration, to actualize deep bass and realistic sensation

Recent situation of product: Thermo-electric module

Thermo-electric modules



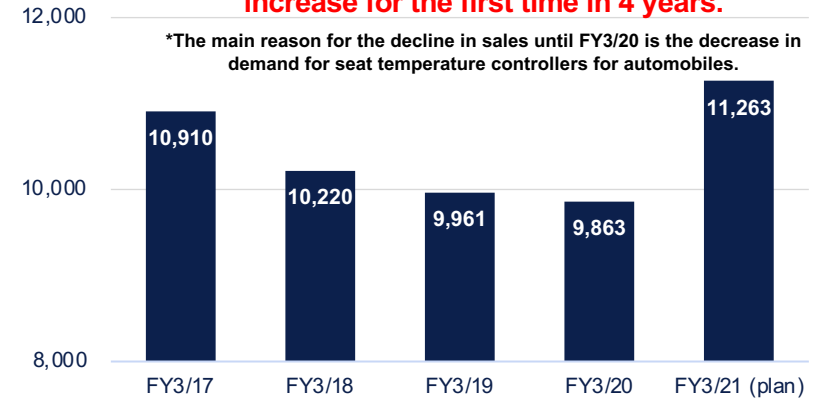
- Sales for FY3/21 are expected to increase 14.2% year on year.
- **Applications for 5G communication devices are expanding** (Estimated number of 5G communication bases in China: 650,000 in 2020, 770,000 in 2021 and 930,000 in 2022)
- As digitization is progressing with consumer products (wearable devices), IoT, home appliances, etc., the purposes of use of thermo-electric modules and the demand for them are increasing.

Variations in sales from FY3/17 to FY3/21 (plan for FY3/21)

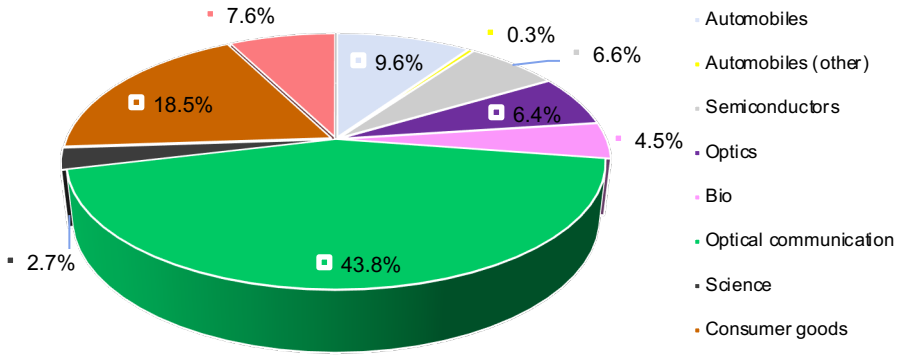
(Million yen)

★In the FY3/21 plan, sales are predicted to increase for the first time in 4 years.

*The main reason for the decline in sales until FY3/20 is the decrease in demand for seat temperature controllers for automobiles.



Ratios of purposes of use of thermo-electric modules in 2Q of FY3/21
*Power substrates excluded



★The optical communication domain for 5G communication devices is expanding.

Acquired RMT Ltd. in Russia through M&A, which possesses expertise in micro-thermoelectric modules

Acquired the shares of RMT Ltd. in Russia. *Plan to make it our wholly-owned subsidiary by the end of 2020.
RMT Ltd. possesses technological capability to produce multistage micro-thermoelectric modules (less than 150 μ) as well as to develop high-quality bismuth telluride (Bi2Te3) material.

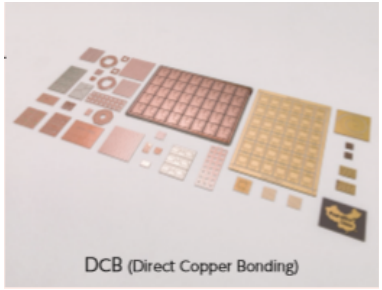
Thermo-electric module production bases of the Group
***RMT Ltd. will be added.**

Thermo-electric modules are being adopted for controlling the temperatures of underwear and jackets.
*The demand for thermo-electric modules for wearable products is expected to grow remarkably.

Jacket that can get cooler and warmer (prototype)

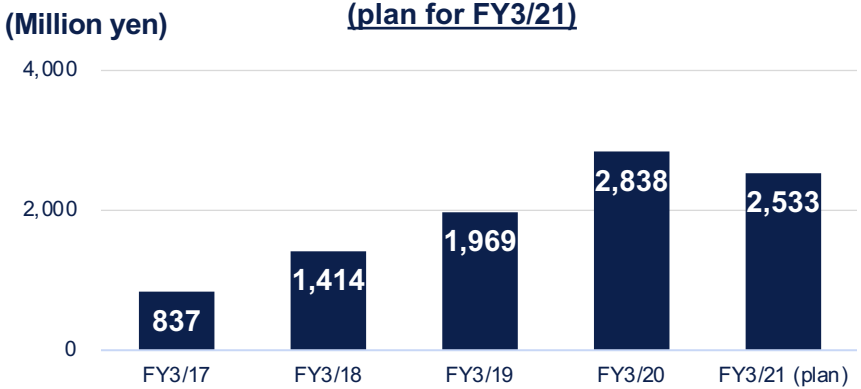
Recent situation of product: Power semiconductor substrate

Power semiconductor substrates

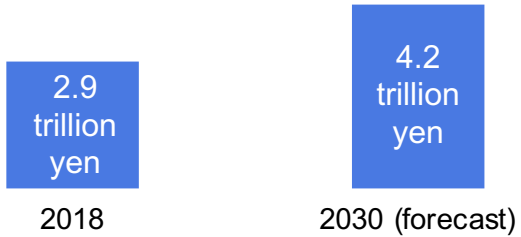


- In the FY3/21 plan, sales are forecasted to decrease 10.7% year on year due to factors such as a decline in demand for industrial equipment and in-vehicle devices.
- As there is a global trend of power consumption reduction, **our business is growing steadily.** (The scale of the power semiconductor market is estimated to be 4.2 trillion yen in 2030.)
- Due to the trade friction, etc., **our market share in China expanded. An increasing number of global makers are adopting our products.**
- The clients are mainly in Europe, Japan, and China.

Variations in sales from FY3/17 to FY3/21 (plan for FY3/21)



Global market of power semiconductors



*Produced by our company with reference to the data of Fuji Keizai.

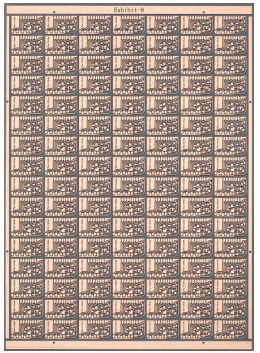
Power semiconductor substrates: To release AMB substrates to expand our business scale

- As demand is estimated to increase also in the automobile field, we will release AMB substrates in addition to DCB substrates.
- The power semiconductor substrate factory in Dongtai, Jiangsu is expanding its production capacity, and sales are estimated to keep growing in the next and following terms.
  (Production capacity in 2020: 600,000 DCB substrates and 100,000 AMB substrates at Shanghai and Dongtai factories)
  *Considering the increase in the monthly output of DCB substrates to 1 million substrates and the monthly output of AMB substrates to 200,000 substrates in FY2021
  *Plan to list the subsidiary in Dongtai City, Jiangsu Province on the STAR Market.

★As the demand for in-vehicle devices grew, the demand for AMB substrates increased.

DCB substrates (Direct Copper Bonding)

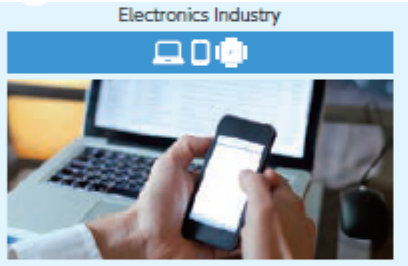
Material: Alumina ceramics

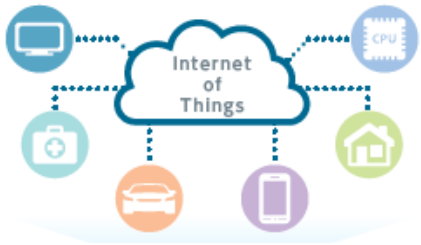


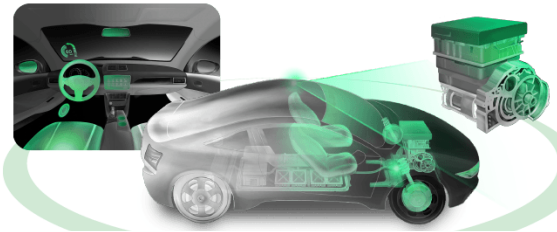
AMB substrates (Active Metal Brazing)

Material: Silicon nitride

Business strategy for in-vehicle device-related business



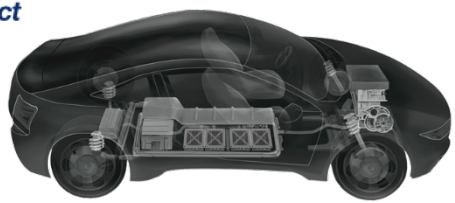




Full-scale foray into the automobile market with our core technology

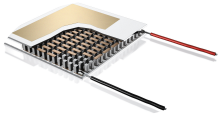
Promotion of automotive project

Ferro Tec Automotive Project



- By utilizing the strengths of our products, including the heat dissipating/cooling property of thermo-electric modules and the sealing property of ferrofluid, we will expand the business of in-vehicle devices, in which the demand for semiconductors will increase.
- Our products are used for various purposes, including the temperature control of CMOS sensors and lithium ion batteries, and cup holders.
- We have already established an independent section, and started enhancing marketing. Full-scale foray into an automobile field considering M&As as necessary.

Our products that can be used for in-vehicle devices



Thermo-electric module

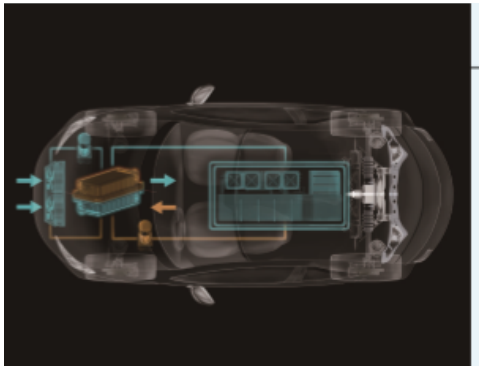
Ferrofluid

Power semiconductor substrate

Application of thermo-electric modules to in-vehicle devices (Examples of products for EV and ADAS)

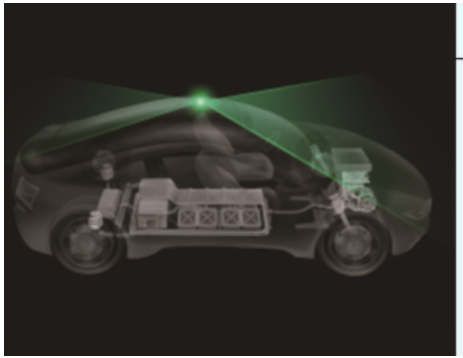
Thermo Electric CMOS Cooler for ADAS

CMOS image sensors are used for cameras in ADAS. Dark current noise is produced in a CMOS image sensor if temperature rises. By using thermo-electric modules, it is possible to control the temperature of CMOS image sensors with their compact, lightweight and convenient properties and reduce the dark current noise.



Thermo Electric Battery Heater Cooler

Batteries used for EVs, HEVs, PHEVs, etc. are very sensitive to temperature. High temperatures affect the lifespan of each battery, while low temperatures affect the performance of each battery. By using thermo-electric modules, it is possible to control the temperature of the batteries with their compact, lightweight, convenient and efficient properties.



LiDAR

By irradiating an object with a laser while scanning and observing the reflected laser, it measures the distance from that object and identifies the properties of that object. Heat makes it difficult to conduct accurate measurement with a laser. By using thermo-electric modules, it is possible to control the laser source and stabilize measurement precision.

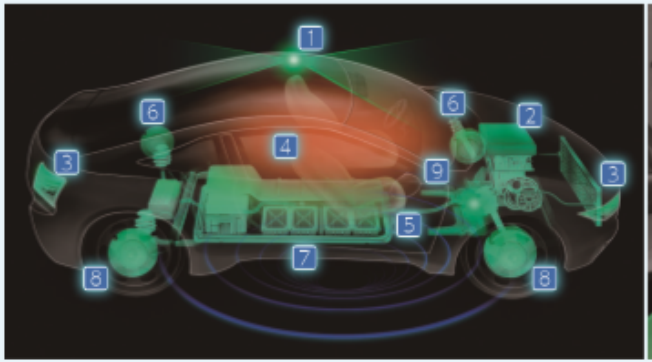
In-vehicle applications we are proposing to clients (some already adopted)

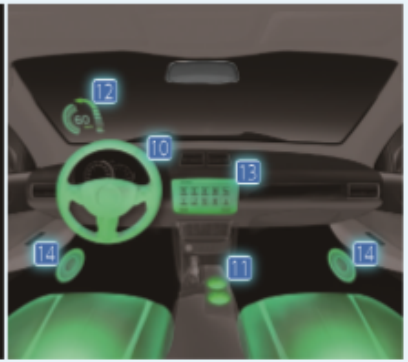
In-vehicle device-related business

Ferrotec Material Technologies Corporation, which is growing mainly in the semiconductor market, will promote our core technologies of thermo-electric modules (Peltier element), ferrofluid, etc. for the automobile market, which is expected to see significant changes in applications, such as EVs, PHVs, and automatic driving systems.

Thermo Electric Cup Holder

By using thermo-electric modules, it is possible to make compact, lightweight cup holders have the heat-retaining/cooling function easily. They can keep cold drinks cold and warm ones warm.





Thermo-electric module and applications

1. Laser radar
2. Battery cooling
3. Laser headlights
4. Seat cooling system
9. ADAS GPU CPU CMOS
   GPU cooler
   CMOS cooler
10. Steering heater cooler
11. Cup holder
12. HUD (Head-up Display)

Magnetic fluids and applications

2. Engine suspension
4. Seat suspension
6. Suspension around the foot
7. Hzero® high-precision DC sensors for monitoring SOCs
8. Hzero® composite wheel in motor
13. Touch panel & center
14. Audio

Power semiconductor substrates and applications

2. Engine
   Engine control
3. Bodies
   Headlamp control
   Room lamp control
5. Powertrain
   HEV motor control
   Brake control
   Transmission control
   Steering control

Points the Group will strengthen in the future to achieve the sustainable development of the company

Basic Policy:

We aspire to be a trusted company by continuing to grow for the sake of the stakeholders such as customers, shareholders, employees, business partners, and local communities, and by following the social code of conduct such as law and regulations, social order, and international rules in corporate activities.

◇Priority policies for enhancing the organizational strength of the Group and work towards sustainable development

1. Efforts to improve corporate value

- Promote management independence of all business subsidiaries
- Redistribution of management resources

2. Thorough awareness that puts quality first

- Perfect design and product quality that pleases customers
- Improvement of service quality inside and outside the company

3. Strengthening corporate governance

- Thorough internal control and management of affiliated companies
- Strengthening risk management and compliance

Notes on forward-looking statements

- The forward-looking statements in this document are based on information available as of the date of publication of this document and assumptions concerning uncertain factors affecting future results.

- Actual results may differ materially from these forecasts due to various factors. Such factors include, but are not limited to, international conditions, economic conditions, product supply and demand trends, raw material prices, market conditions, and exchange rates.

- Quantitative targets and capital investments in these materials represent medium-to long-term strategies and visions, and are not performance forecasts. We undertake no obligation to update any information with respect to these matters.

- For official forecasts, please refer to the disclosure of financial results based on the Tokyo Stock Exchange Regulations.

<Inquiries>

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