

# Latest China business (Power Devices, Electronic Devices, etc.)

ULVAC (China) Holding Co.  
Takaya Iwai, President

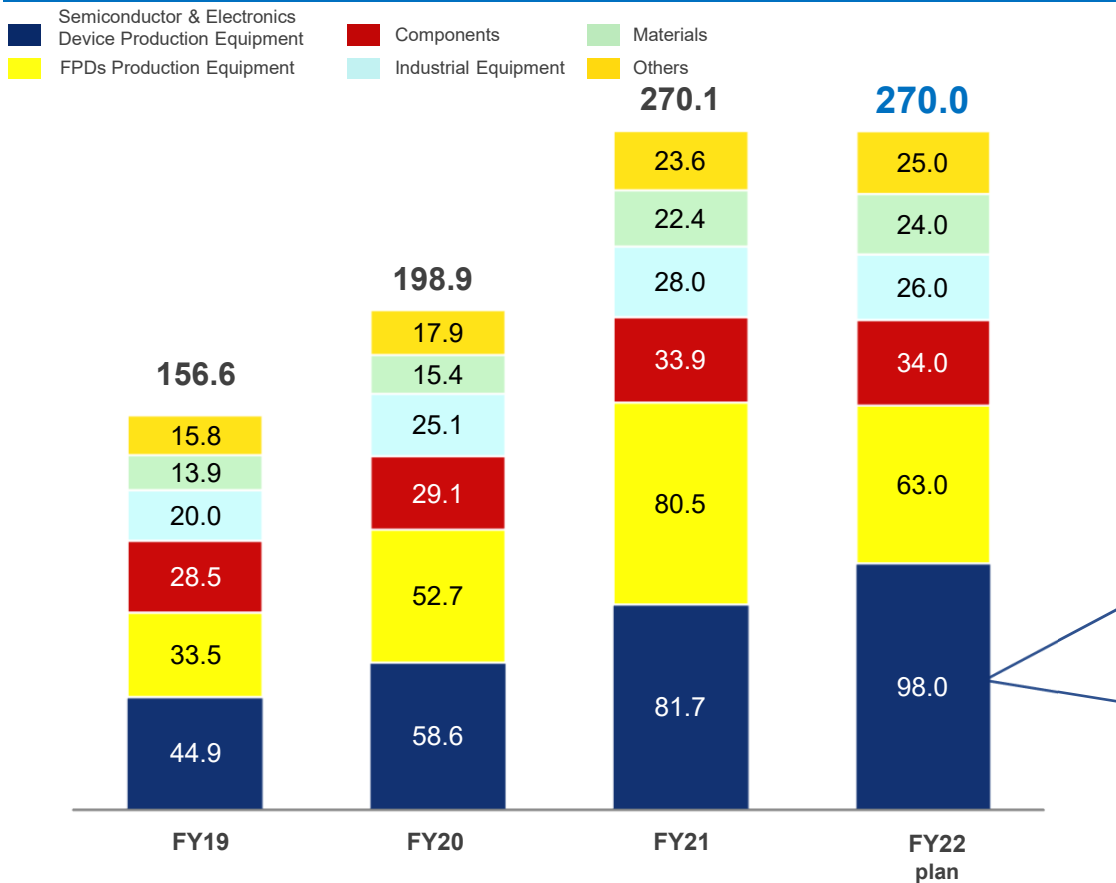
*Leading the World  
In Vacuum Technology*

**ULVAC**



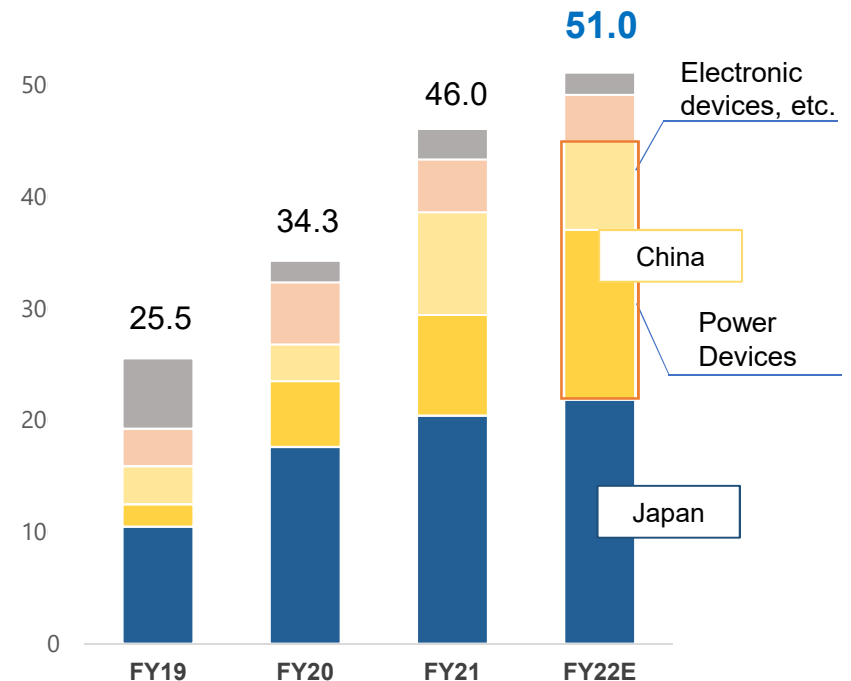
- **FPD:** Decrease in reaction to the strong investment in LCD for IT panels in FY2009 ⇒ Expect orders and sales of 70~80 billion yen in OLED investment for IT panels (sputtering equipment) and roll-to-roll equipment for batteries in FY2023 and beyond
- **Semiconductor Electronics:** Growth mainly in power semiconductors, etc. in China

## Orders received (Unit: ¥1 billion)



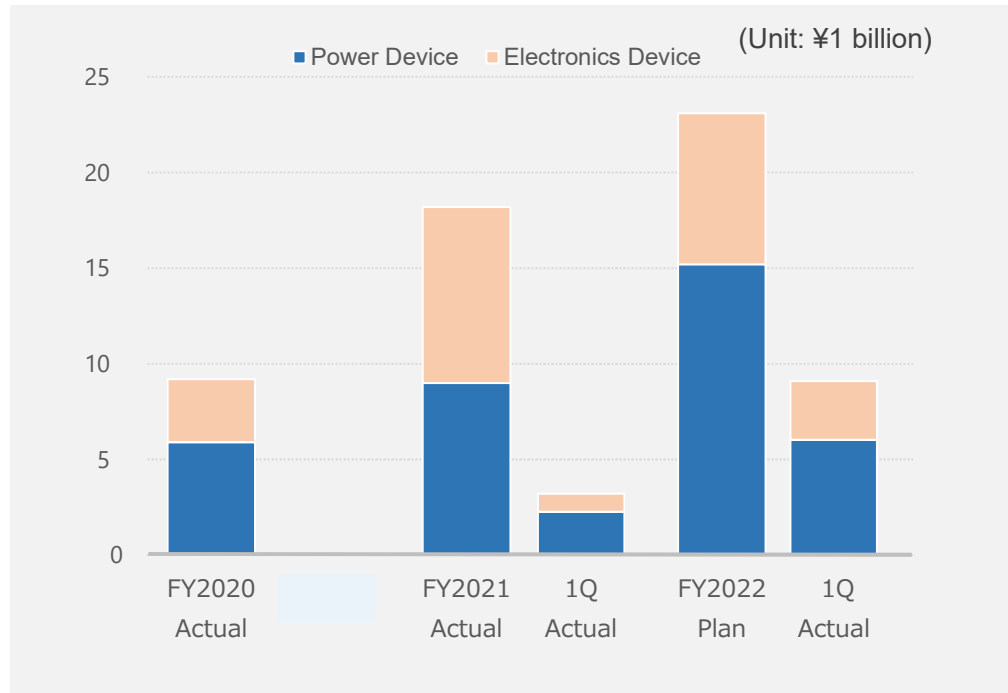
## Electronic Ordering Plan (by region)

(Unit: ¥1 billion)



- Continued expansion of investment in Chinese power devices
- In power devices, investment is expanding in the areas of Si-MOSFET and IGBT in addition to SiC
- In the optical devices,  $\mu$ OLEDs are also entering a transition period from development lines to investment in mass production lines.
- In the MEMS and sensor-related business, our mainstay sputtering equipment has been introduced to the development lines of major Piezo-MEMS customers.

## Orders Received in China



## Order Trends: FY2022 Outlook

- ☑ Orders for power devices, mainly SiC ion implantation and Si-MOSFET evaporation deposition systems, increased 2.7 times from the previous fiscal year
- ☑ In optical devices, after orders for development lines of  $\mu$ OLED for AR/VR applications have run their course, business negotiations for the establishment of mass production lines are brisk.
- ☑ In MEMS devices, the sputtering equipment for Piezo-MEMS that we are focusing on has been delivered to the major customers for R&D and small-scale production lines and there are still more than a dozen projects in negotiation.

## Increase in demand for electronic devices and breakaway from import dependence

- Power Devices
- Various electronic devices



## China domestic production policy

- Stabilization of supply chain
- Improved trade balance

## Local government support (various incentives and assistance)

## Demand from the world's factory

- More than 30% of industrial products are produced in China
- 30% demand of semiconductors, power devices and various electronics in the world, is from China

## Acceleration of domestic investment in China (economic stimulus)

### New energy shift (Green energy)

- Renewable Energy Shift
- New energy vehicles recovery/increase
- Increase in LiB production

### Digital Infrastructure Construction

- 5G base station/data centers

## Increased construction of power and electronic device plants in each province





## ● Policies related to electronic devices

### Policy released at the 20th National Congress of the Communist Party of China (CPC)

#### High-level socialist market economy

- Developing a publicly owned economy while encouraging and supporting the development of a non-publicly owned economy
- Protecting the interests of private enterprises and **promoting the development of the private economy**

#### High level of external openness

- Moderating reduction of negative list of foreign investment entry
- **Protecting the rights and interests of foreign investment**
- Promoting "One Belt, One Road" Construction

#### Building a modernized industrial system

- **Focusing on the "real economy" development**
- Enhancing manufacturing power, quality improvement, space development, transportation, internet and Digital China construction
- **Sophisticated, smart, and green manufacturing**

Emphasis on "real economy" such as manufacturing

Emphasis on Industrial sophistication, innovation and transformation of economic growth engine, etc.

#### Rural Development

- Building an "agricultural powerhouse" and strengthening food security
- Increased revenues for farmers, improvement of public infrastructure in rural areas

#### Harmonious development between regions

- Promoting civilianization of population relocated from agriculture
- Promoting urbanization with the county castle as an important recipient

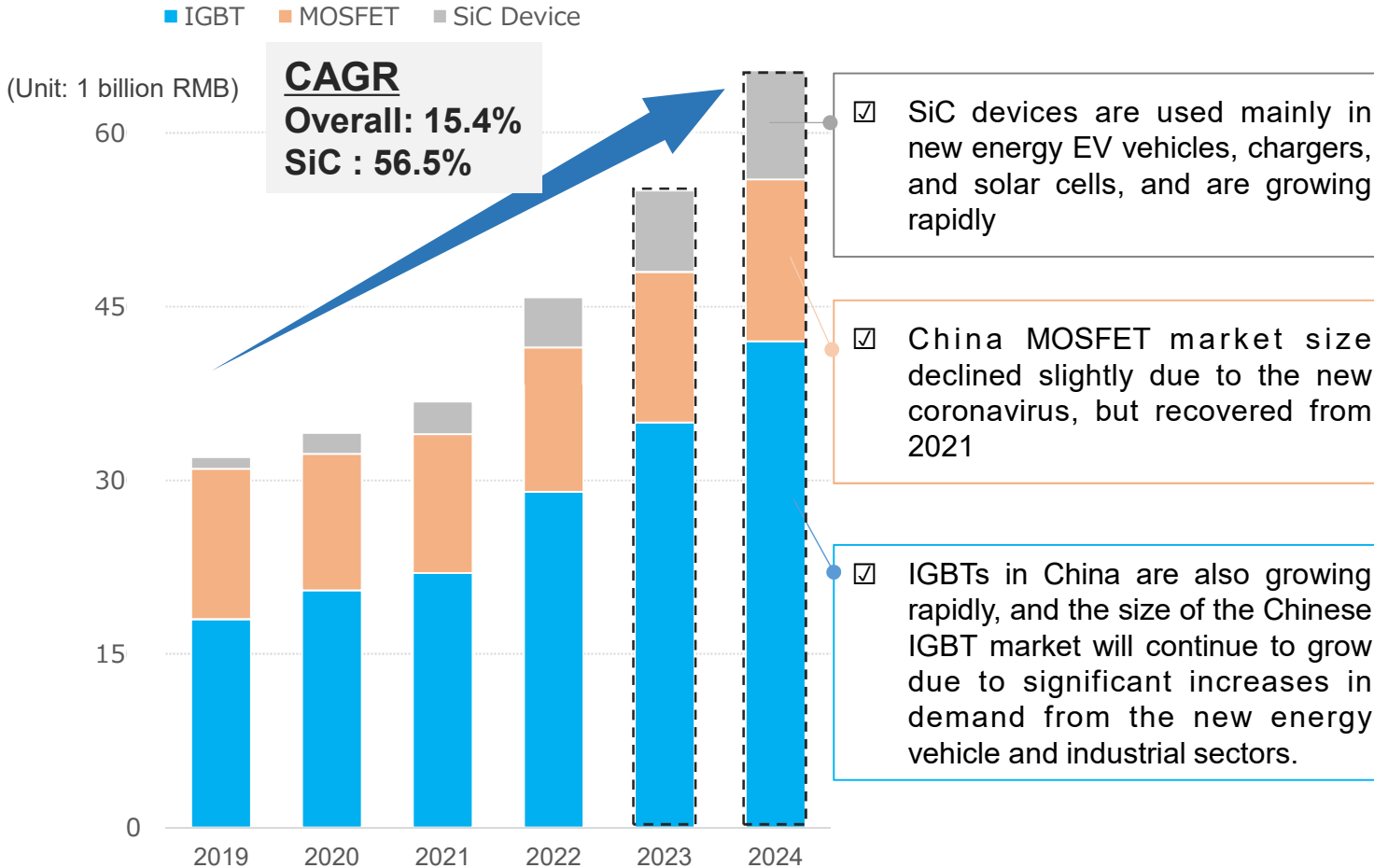
### National Key Research Plan on Power Devices (2021)

Strengthen development of power semiconductors of SiC, GaN, and other next-generation materials at the national level

Product type	Specific target criteria
SiC power electronics materials and devices for NEVs	<ul style="list-style-type: none"> <li>• Developing 1,200V high current and high reliability SiC power electronics chip</li> <li>• Developing 1,200V high current and low thermal resistance SiC power module</li> </ul>
High-efficiency power electronics materials and devices based on GaN for big data center applications	<ul style="list-style-type: none"> <li>• Mass production of 650V domestic GaN material and power electronics devices</li> <li>• Realization of 650V GaN substrate planar coupling device with on-resistance less than 4mΩ/cm<sup>2</sup> as well as less than 30mΩ</li> </ul>
Large SiC single crystal epitaxy system	<ul style="list-style-type: none"> <li>• Realizing mass production of 6-inch SiC epitaxial materials</li> <li>• Realizing breakthrough of core technology in 8-inch SiC single-crystal substrates</li> </ul>

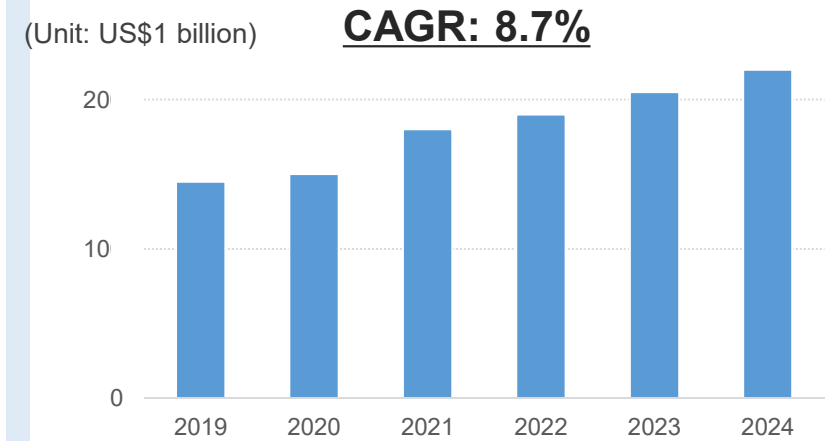
Global power semiconductor demand grows significantly  
China's market is expected to expand further with the addition of demand for domestic production replacement

## China Power Device Market Size

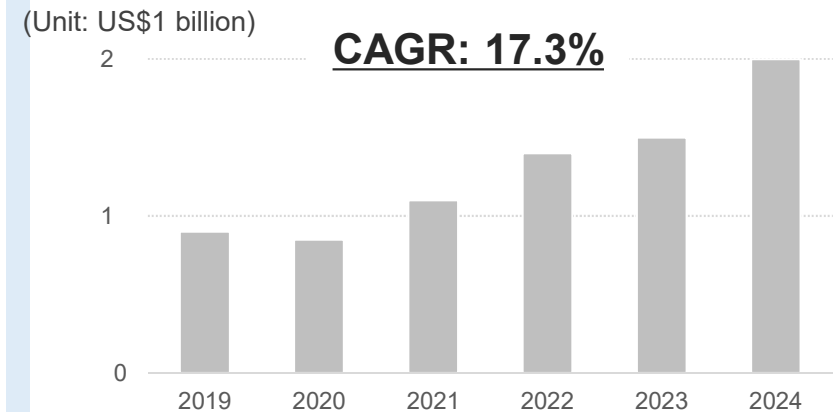


Source: Trendforce and Omdia data

## Global Power Device Market Scale



## Global SiC Market Scale



Source: from Omdia data

- Domestic production of wafer : The Key for SiC power devices business

## 6-inch wafer production by major SiC wafer suppliers

(Unit:10,000 sheets/year)

Chinese SiC Wafer Company	English name	Current estimated production capacity	Plan for 2024
1 天岳先進科技	SICC Co.	7	30
2 天科合達	TankeBlue Semiconductor Co.	6	50
3 露笑科技	Roshow Technology Co.	2.5	20
4 同光晶体	Hebei Synlight Semiconductor Co.	2	12
5 中电化合物	CEC Compound Semiconductor Co. (Abbreviated name: CECS)	2	12
6 超芯星半导体	Hypersics Semiconductor Co.	2	150*1
7 东尼电子	Zhejiang Tony Electronic Co. (Abbreviated name: Tony Tech)	2	20
8 三安集成电路	Xiamen Sanan Integrated Circuit Co. (Abbreviated name: Sanan IC)	1	10
9 博蓝特半导体科技	zhejiang bright semiconductor technology co.	1	15
10 中科钢研节能	CISRI-ZHONGKE ENERGY CONSERVATION AND TECHNOLOGY CO.	Small lot production	10
11 山东粤海金半导体科技 (旧国宏中能)	Shandong Guohong Zhongneng Technology Development Co.	Small lot production	10
12 南砂晶圆	Guangzhou South Sand Waste Semiconductor Technology Co.	Small lot production	25
13 亮晶新材料	long vowel mark (usually only used in katakana)	Small lot production	8
14 微芯长江半导体材料	Anhui Weixin Changjiang Semiconductor Material Co.	Starting up	12
15 世纪金光	Beijing Century Goldray Semiconductor Co.	Starting up	12
16 中鸿新晶科技	long vowel mark (usually only used in katakana)	Development stage	10
17 科友半导体	Harbin KY Semiconductor , Inc.	Development stage	10

- ☑ SiC wafer production in China, which was mainly 4-inch, has already switched to 6-inch.
- ☑ Each company has announced plans for mass production of more than 100,000 pieces/year in 2024.

- Features of ULVAC Ion Implanter for SiC

### ULVAC's Strengths

- ✓ Ion implantation with high energy and collimated beam
- ✓ High-temperature and room-temperature process treatment
- ✓ Injection in several stages to different depths
- ✓ Channeling Infusion (Superjunction)

Supporting mass production of Chinese companies for the past 10 years.

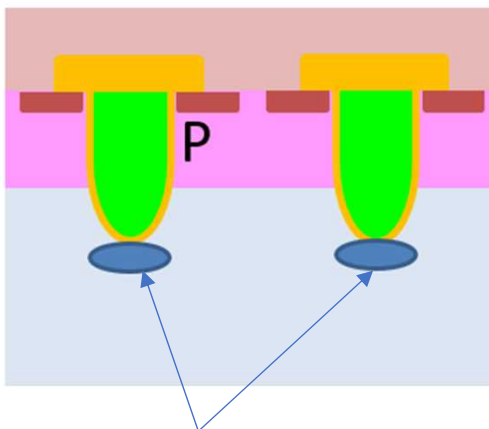
**Over 70% share of ion implanter market for SiC in China**



Ion implanter for SiC  
IH-860PSIC

## Feature Description: Multi-stage injection with a single unit

SiC-Trench MOSFET Structure



Ion implantation in this area requires both high energy implantation above 1 MeV and ion beam parallelism

	Energy Band
1 charge	10 to 400 keV
2 charge	~800 keV
3 charge	~1200keV

This equipment has a wide energy range from 10kV to 1200keV, and the entire trench MOSFET process can be performed with a single unit.

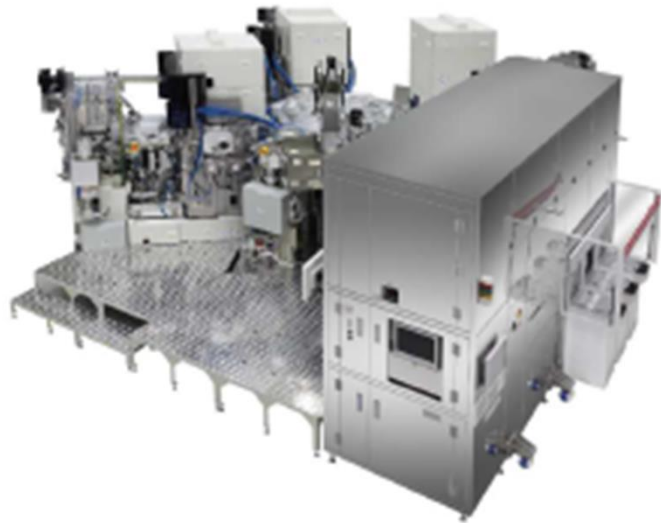
**Easy to construct process, production line**



- Other Electronic Devices Market  
Each device will continue to grow along with its expanding applications.

## Optical-devices ( $\mu$ OLED)

$\mu$ OLEDs, which feature high contrast and high resolution, are being developed and prototyped as next-generation display devices for use in VR/AR units.



Film Deposition System for Organic Devices

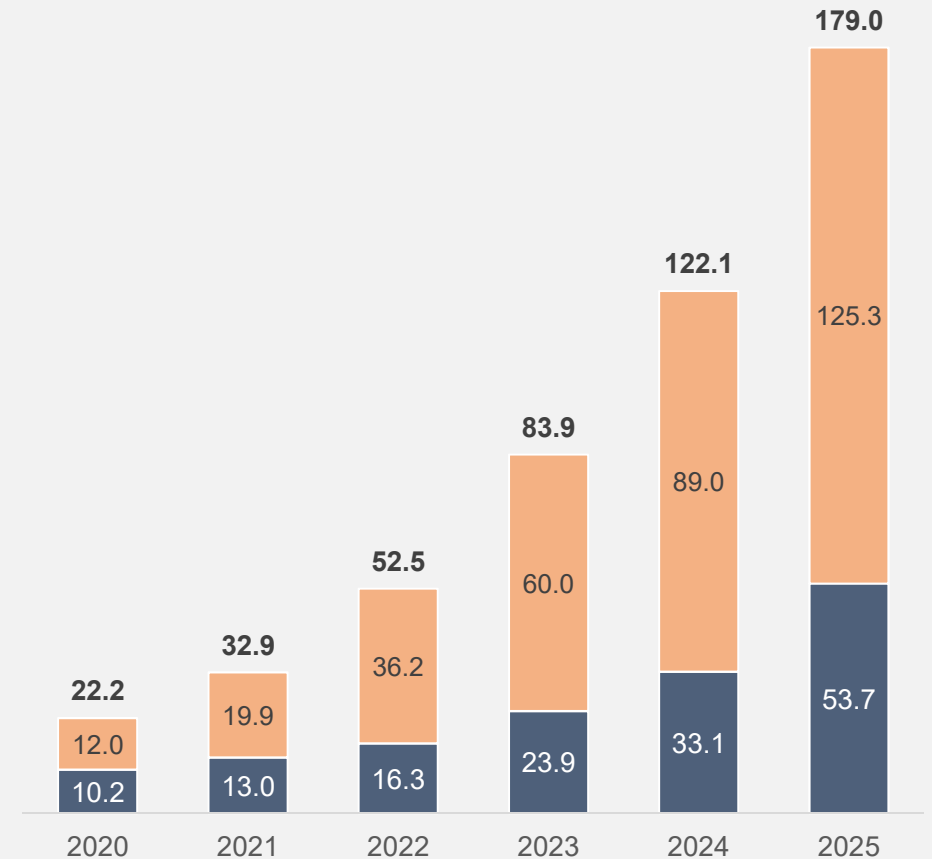
### ULVAC's Strengths

- ✓ Delivered to major customers' development lines
- ✓ Providing modules that meet customer needs based on the strength of each process
- ✓ Also supporting evaporation deposition process

## China AR/VR units Market Forecast

(Unit: 1 billion RMB)

■ VR Hardware ■ AR Hardware



Source: EO Intelligence

- Other Electronic Devices Market  
Each device will continue to grow along with its expanding applications.

## MEMS Sensors

Nearly 120 investments were made in China in 2020 alone in MEMS sensors, which are experiencing rapidly growing demand for automotive and consumer electronics applications.

Several customers adopted our equipment for Piezo-MEMS production.



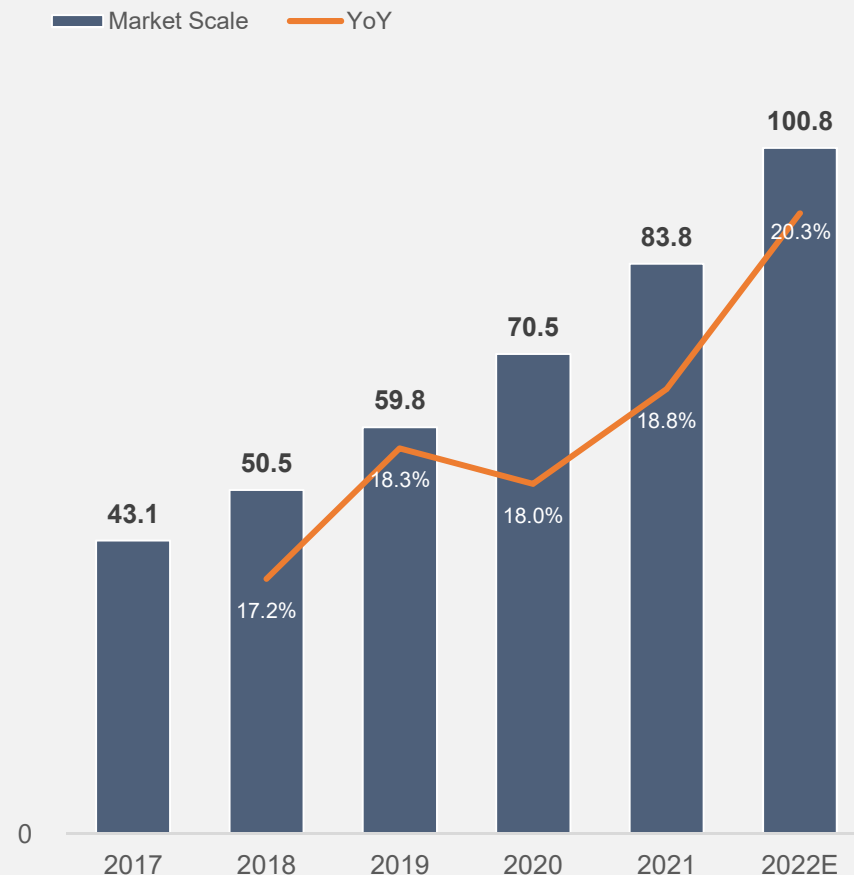
Multi-chamber composite module type deposition processing equipment

### ULVAC's Strengths

- ✓ Accumulated data of PZT process
- ✓ Deposition chamber suitable for high temperature and dielectric processes
- ✓ Entering sales expansion phase of equipment for mass production based on actual business results

## China MEMS Sensor Market, Growth Rate

(Unit: 1 billion RMB)



Source: Tenpu Securities

Breakthrough 2022

- Expansion of China equipment production

Planning to establish a new mass production system for ion implanters used for power devices in Suzhou plant, which has achieved mass production of large-size LCD and evaporation deposition equipment and promote localization to produce more than 1/3 of the equipment to be delivered in China by 2023.



Ion implanter for SiC  
IH-860PSIC

ULVAC (SUZHOU) CO., LTD.



- ☑ Establishment of China supply chain (local procurement)
- ☑ Training of design and manufacturing engineers
- ☑ Improved service to customers located in a wide range of areas



# ULVAC Vacuum Technology Contributes to Many Industries and Applications



**ULVAC**