

Q&A at the Explanation Meeting on the Copper Foil and Engineered Powders Business

Reference: Material for the Explanation Meeting on the Copper Foil and Powders Business

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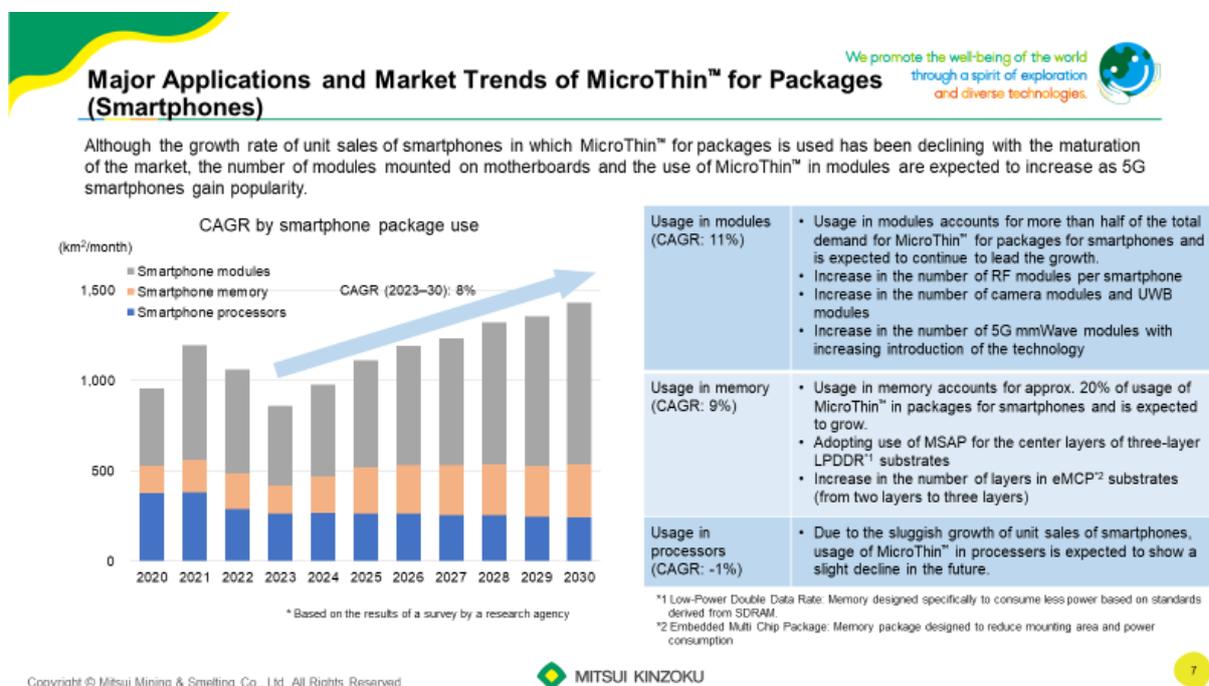
Note:

PKG = Package substrate

HDI = High density interconnect—a printed circuit board with a high wiring density that serves as a motherboard.

Line/Space = Circuit line width and the space between circuits. The unit is μm (micrometers)

■ Q&A Session



Q.

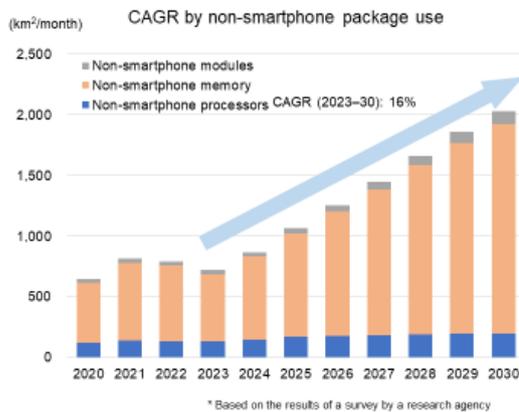
An expansion of specific applications of MicroThin™ for PKGs was mentioned in this explanation meeting. Although I had the impression that smartphone applications would not increase until 5G mmWave or so was achieved based on past explanations, I now feel differently. Could you provide a specific explanation, including examples of new applications, in relation to your expectations for increases in 2024 and 2025?

A.

Regarding the description on page 7 of the explanation meeting material, the main application in FY2023 is North American brand smartphones. We are currently analyzing these models. The usage in modules has undergone significant changes. MicroThin™ has been used particularly in wide angle lens camera modules. This area largely changed the year before last and last year. PKG demand for smartphones has grown so far. We believe that, including this camera module, they will continue to drive demand in a way that is not proportional to the number of units.

Major Applications and Market Trends of MicroThin™ for Packages (Non-smartphones)

MicroThin™ for packages, which is used as a substrate material for DRAM and NAND, is also increasingly used for packages in a wider range of non-smartphone applications, including data centers, game machines, drones, and on-vehicle applications.



Usage in modules (CAGR: 18%)	<ul style="list-style-type: none"> Although there is originally not much need for MicroThin™ in micro wiring, its implementation in image sensors, ADAS, automatic driving, and other on-vehicle applications is expected to increase. Owing to the growth of IoT, usage of MicroThin™ in WiFi and other communication modules for industrial equipment is expected to increase.
Usage in memory (CAGR: 18%)	<ul style="list-style-type: none"> Usage in memory will account almost entirely for future growth. Demand for MicroThin™ for data centers and on-vehicle applications has been increasing. There has been a shift toward DDR5 with a high use rate of MSAP, where MicroThin™ has been increasingly implemented. There has been a shift in PC and on-vehicle applications from DDR to LPDDR.
Usage in processors (CAGR: 6%)	<ul style="list-style-type: none"> Usage of MicroThin™ in processors is mainly in FC-BGA, and its implementation in processors will be limited in the future.

Q.

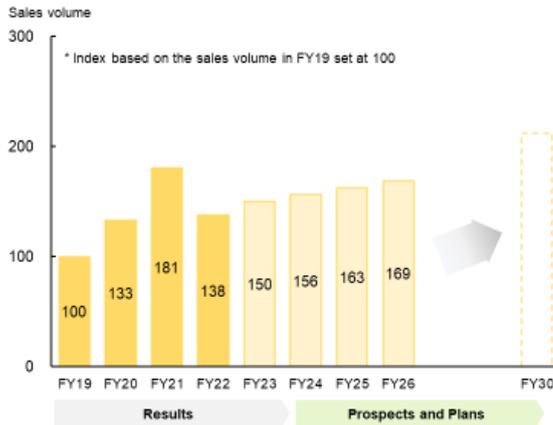
On page 8 of the explanation meeting material, it is indicated that the demand for MicroThin™ in non-smartphone memory will significantly grow in the medium to long term. What is the background for this? I mean, will the overall final demand or the entire market scale grow? Will their adoption rate in the memory rise? Are there competing products?

A.

We anticipate a substantial growth rate, nearly 40% from 2023 to 2030, in datacenter memory. In this situation, the adoption rate of MicroThin™ has also risen with the upgrades to DDR3, DDR4, and DDR5. In brief, the number of memory modules for datacenters will increase and the usage rate of MicroThin™ in these memory modules will also increase. We will receive both of these effects.

Sales Performance and Forecast for MicroThin™ for HDI*1

In FY23, unit sales of North American brand smartphone remained flat, but demand for MicroThin™ increased slightly. In the future, we will promote the use of MT-FL, which is suitable for finer wiring. We are continuing to promote the use of MSAP to Chinese smartphone manufacturers.



FY22

- Reduction in smartphone production as a result of lockdowns of Chinese cities due to COVID-19

FY23

- Unit sales of smartphones in the North American market remained flat, but demand for MicroThin™ increased slightly.
- Increase in use of MicroThin™ in Chinese smartphones (foldable models)

Forecast for FY24 and beyond

- Increase in the number of electronic devices where MicroThin™ is used with the popularization of 5G technologies
- Expansion of introduction of MicroThin™ in Chinese high-end models

- Promotion of use of MSAP to Chinese smartphone manufacturers
- Reinforcement of the marketing structure in Greater China (use of the marketing bases in the South China region and Taiwan)

*1: High Density Interconnected PCB

Q.

On page 11 of the explanation meeting material, the expectation for significant growth of MicroThin™ for HDI appears to slightly tone down. Tell us about the reasons for the lack of advancement in adoption and what factors could trigger its advancement in the future. Has the line & space (L/S) not reached the necessary level yet? Are there ongoing efforts to enhance the subtractive method?

A.

The current L/S of MicroThin™ for HDI is 30/30 μm and has not largely advanced last year and this year. At present, we think that this year's model will have an L/S of about 30/30 μm though we expect further thinning in the future due to causes such as functional enhancement of motherboards and size reduction of motherboards for an increase of battery area. Chinese smartphones will trigger the growth of MicroThin™ for HDI in the future. At this point, three companies have adopted this product for their foldable models. We feel the customers have got used to the MSAP because they have adopted it even after remodeling. As other Chinese smartphone manufacturers have started assessing the product, we hope for adoption in their main models. But we are still uncertain about the timing of their adoption, and it is challenging to provide a specific timeframe.

Q.

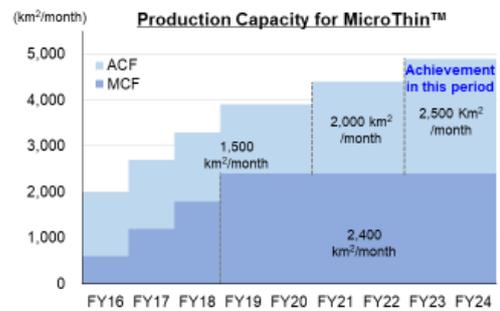
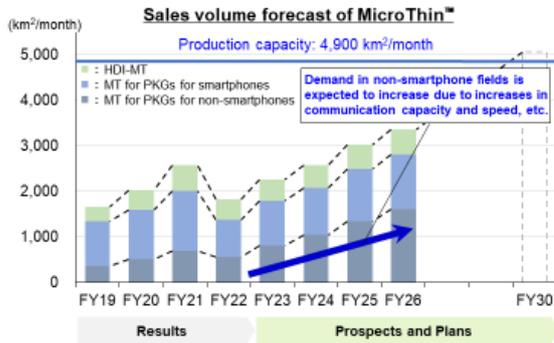
There are rumors that resin coated copper (RCC) will be used in smartphones either this year or the next. Could you tell us its impact on your copper foil business.

A.

Although PCB customers started assessing RCC sometime last year, they are also assessing our MicroThin™. In particular, the FL type for fine applications is assessed more than the conventional Ex type. We think boards with resin could be used in the future but MicroThin™ will continue to be used in them. The amount of MicroThin™ used is expected to remain the same but it could fluctuate in the short term depending on the yields of PCB customers.

MicroThin™ Sales Volume Forecast and Production Capacity

With high-speed communication technologies being developed, we are working to expand opportunities to increase sales of MicroThin™ in both the smartphone and non-smartphone fields. We had sufficient production capacity to cater to present demand, but we further increased the production capacity by improving productivity in the previous year.



- MicroThin™ for packages
Demand in non-smartphone fields is expected to expand due to increases in communication capacity and speed, etc.
- MicroThin™ for HDI
Promotion of use of MSAP to Chinese smartphone manufacturers (It is currently used by three manufacturers.)

- By improving work satisfaction for improving labor productivity and introducing DX to improve operation rates, as well as improving yields and other technological factors in ACF, the production capacity was increased to a production of 2.5 million m²/month.
- Continuation and promotion of transfer of production of MicroThin™ for packages to MCF (Effective use of both bases)

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Q.

You are anticipating significant growth of MicroThin™ for PKG. How will you produce it in the future? How will you increase production capacity? How will you divide roles between Ageo and Malaysia?

A.

Regarding the division of roles between Ageo and Malaysia in manufacturing MicroThin™, in principle, we have produced MicroThin™ for HDI in Malaysia and MicroThin™ for PKG in Ageo. However, as the capacity of Ageo is running out, we are transferring the production of MicroThin™ for PKG in Ageo to Malaysia. We are still continuing this transfer and have already completed a large portion of the transfer of MicroThin™ for PKG for Taiwan and China. We plan to test new MicroThin™ products and mainly manufacture and sell higher added value GN (described on page 6 of the explanation meeting material), etc. in Ageo.

Q.

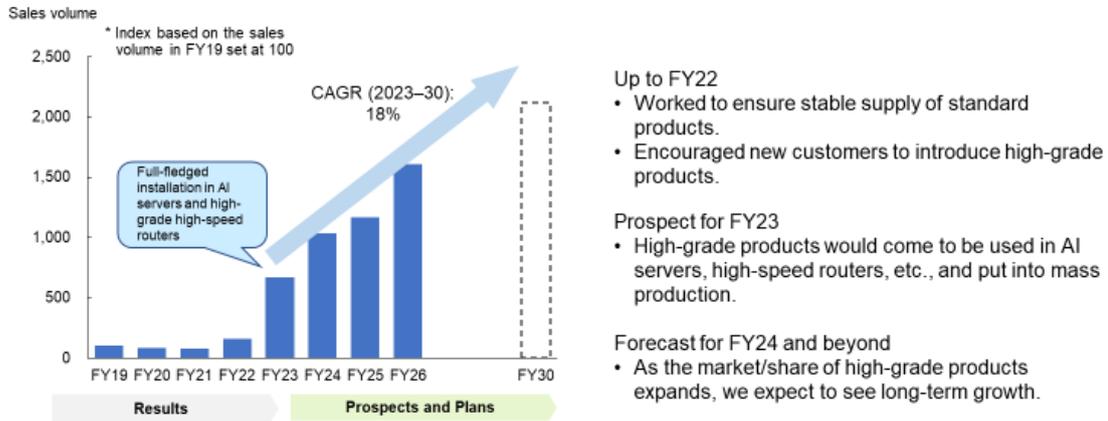
The explanation meeting material graphically shows the change in the quantity of MicroThin™. The graph shows large changes in 2022 and 2023 and further acceleration from this year. Although you have explained changes in demand from the top-down viewpoint, how will the demand actually increase? Could you tell us your expectations based on specific adoptions and other factors based on which you calculated this CAGR?

A.

Regarding MicroThin™, for example, if edge AI servers increase alongside cloud AI servers as described on page 18 of the explanation meeting material, a large number of people will buy edge AI servers due to their affordability. Then, how to lower the price of GPU trays will become an issue. We expect that, as memory-related items in this GPU tray shift from HBM to inexpensive GDDR (graphic DDR), the amount of MicroThin™ used in it will increase.

Sales Performance and Forecast for High-Grade VSP™

With the growth of the market of foil products for information and communication infrastructure, demand for high-grade VSP™ foil products (of category H-VLP2 or higher) for high-speed transmission is expected to expand.



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Q.

The explanation meeting material graphically shows the change in the quantity of VSP™. The graph shows large changes in 2022 and 2023 and further acceleration from this year. Although you have explained changes in demand from the top-down viewpoint, how will the demand actually increase? Could you tell us your expectations based on specific adoptions and other factors based on which you calculated this CAGR?

A.

As shown on page 17 of the explanation meeting material, there is a trend that AI servers will increase in the future in relation to VSP™ and VSP™ is adopted in items related to edge AI servers as well. Based on this information, we expect approximately 18% growth from 2023 to 2026. This number is based on the assumption that VSP™ will grow in proportion to the growth of AI servers.

Q.

Information on the enhancement of VSP™ production capacity was released around 2019. Is the current production capacity large enough to cover the 2026 number without problems?

A.

The current production capacity is large enough for the 2026 number. We are considering changing the product mix between our electro-deposited copper foil factories in Taiwan, Malaysia, etc. if the product grows beyond that. Considering the current demand outlook, we believe that the production capacity of our Taiwanese factory will suffice.

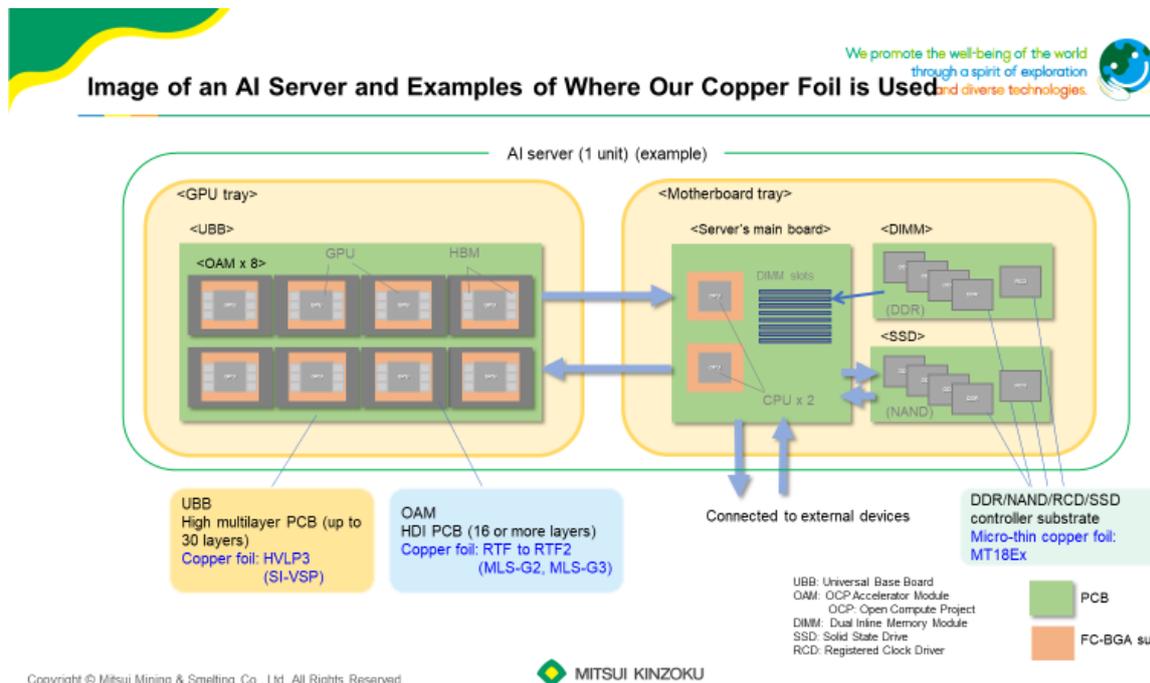
Q.

Tell us about room for productivity improvement such as the production yield of VSP™ and cost reduction per unit.

A.
Productivity improvement is one of our biggest challenges. We still have productivity challenges including yield and are currently taking measures to further enhance productivity.

Q.
For VSP™ productivity improvement, are you making small improvements in the field?

A.
We are. Although we manufacture VSP™ mainly in Taiwan, we are currently sending engineers from Ageo to enhance productivity.



Q.
Regarding competing products of VSP™, tell us what kinds of competing products there are, but also tell us the situation in general, covering the VSP™ for AI. I have heard that you have a very advantageous position, but I would like to hear an explanation of the details.

A.
Regarding competing products of VSP™, there are a variety of boards such as UBB boards, OAM boards, and server main boards as shown on page 18 of the explanation meeting material and there are competing products in each category. However, we are the de facto main supplier of SI-VSP™ for UBB boards in the recent AI server field. As products move into the higher-end range, competition decreases. However, many different competitors, including Taiwanese, European, and Japanese companies, have an interest in this field. The competition around VSP™ is completely different from MicroThin™. There are a significant number of similar copper foil manufacturers. In this competition, we have established our current position with our technological capabilities to reliably adapt to customers' resin. We will continue to differentiate ourselves in the future through these capabilities.

Q.

How much contribution does VSP™ make in your electro-deposited copper foil category in terms of quantity, revenue, etc. Also, could you tell us the ratio of UBB and OAM?

A.

Regarding the current VSP™ market condition, the volume of sales including the models for AI servers and switches is well kept though the demand for the model for general-purpose servers is weak. We think that the contribution of VSP™, which is used as the de facto standard, is large. The demand for VSP™ for high-end AI servers and switches is strong. In particular, SI-VSP™, MLS™-G2, and MLS™-G3 are being manufactured at full capacity. In addition, HS1-VSP™ is used in the server main board (shown on the right of page 18 of the explanation meeting material), showing that VSP™ is used mainly for high-end products as expected and it is making a large contribution.

Q.

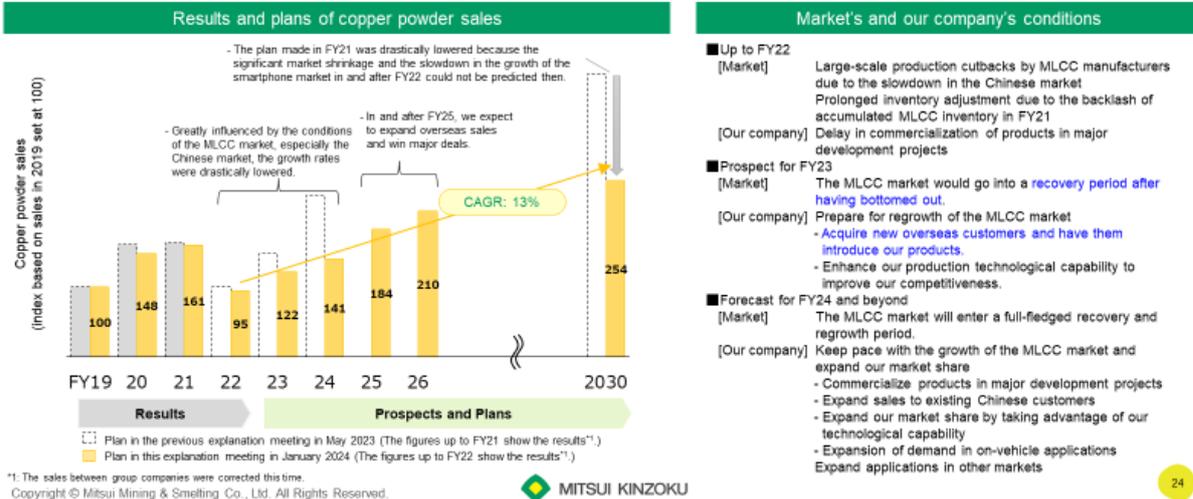
On page 18 of the explanation meeting material, the application example shows how the products are actually adopted. Please tell us in what layers in the core of the multilayer board in this UBB VSP™ may be used and how many of them are used. Also, could you explain how the future demand growth is linked with the adoption speed of copper foil, such as an increase in the number of layers or changes in the specific consumption and yield of the amount of VSP™ used as a whole.

A.

We cannot say in how many of the 30 layers in the UBB VSP™ is used because we do not have that data. However, we have heard that the product is used in quite a few layers. We expect that the amount used will increase as AI servers increase. In other words, we believe that more VSP™ will be used if this trend spreads to significantly compact and easy-to-use edge AI servers though the number of cloud AI servers will be limited due to their price.

Sales Performance and Forecast for Our Copper Powder for Electronic Materials

We reviewed the forecasts of the growth of the MLCC market and then reviewed the sales prospects for copper powder accordingly. The plan for 2030 was drastically corrected in view of great uncertainty about the demand in the smartphone market and other markets. However, since we have secured a footing for expanding overseas sales, we expect sales to grow more than the market.



Q.

Regarding the copper powders for MLCCs, could you tell us about the competition environment with other materials including nickel powders, around when we can expect a turnaround signal, and possible profit improvement measures? I guess that the main reason for the current bottoming out is the inventory adjustment of the models for smartphones. Can they, including in-vehicle models, return to the expected growth?

A.

As far as competing materials in MLCCs goes, copper is used in most external electrodes. Although silver is perhaps used in some of them, we do not consider it a competing material. However, there are many different topics on nickel, which is used in internal electrodes. For example, if MLCCs become smaller, finer nickel powders might be needed. Some customers want to try copper powders in internal electrodes because nickel may dry up. However, we think that the use of nickel in internal electrodes and copper in external electrodes will not change for the time being.

For the demand turnaround, look at the graph on page 24 of the explanation meeting material. We anticipate a gradual growth in demand starting next year, a full-scale recovery in FY2025, and sustained growth at an adequate pace thereafter. However, the growth rate is a bit lower than the previous expectation because the demand for smartphones is low as might be expected.

Q.

Does the share of copper powders for MLCCs not easily fluctuate in the supply chain?

A.

We want to expand our market share through the major development projects mentioned in the explanation meeting material. Sales expansion in the Chinese market has just started.