

Director of
Components
Business Unit

Senior Executive
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Looking ahead at growth markets, we will pursue further miniaturization, increased functionality, and higher reliability.

Our key terms for growth are “5G” and “EVs, V2X, and automated driving”

The key terms that have recently been on the rise in the component industry include “5G” for the communications market and “EVs, V2X, and automated driving” for automobiles. For 5G, it is naturally important to consider which applications will become mainstream as data volume increases significantly, but the evolution of smartphones and all kinds of wearable devices will continue to centralize on becoming smaller and thinner and featuring increased functionality, and capacitors will be required to accommodate larger capacities. In addition, EVs, V2X, and automated driving require high reliability in products that will never fail even in harsh environments such as high temperatures, high humidity, high voltage, and high currents.

In recent years, while the smartphone market has reached a plateau, the number of multilayer ceramic capacitors (MLCCs) used per phone is increasing, especially in high-end models. Specifically, feature phones, otherwise known as “dumbphones,” contained about 200 MLCCs, but this has increased to about 1,000 in high-end smartphones, which has boosted overall shipment quantities.

The same applies to automobiles that are featuring more and more electronic parts, which is why Murata focuses on actually disassembling

and investigating the interiors of automobiles. We are aware that the number of MLCCs, which was less than 3,000 per vehicle in conventional automobiles, has increased to 5,000 in standard HVs, and has reached more than 10,000 for EVs that are equipped with a selection of ADAS functions. Furthermore, by understanding the reasons and ways that electronic components are used in automobiles through the study of manufacturer’s design concepts, we can offer further strength in making proposals to our customers.

Our current share in the MLCC market is about 40%. A major factor in acquiring this high market share is the fact that we can complete everything from development to manufacturing internally. In other words, everything from ceramic material selection to production facilities and manufacturing process technology is taken care of by our own internal framework. As a result, customer requests can be quickly led forward into development, and products can be supplied at a lower cost due to various cost reduction options.

Leveraging technology and accommodating smaller sizes and larger capacities

With regard to electronic components, in recent years customers have desire to procure each individual component from several different companies

in order to diversify their procurement risks. As this trend gains momentum, we can leverage Murata’s strengths in being able to complete everything from development to manufacturing internally, and fully demonstrate our superiority in the ability to supply large quantities quickly and at lower costs in accordance with the customer’s product cycle.

Meanwhile, in order to meet the market’s growing needs for “smaller size, larger capacity” and “high reliability,” we are also focusing on providing increased variations of non-ceramic capacitors made from materials other than ceramics. One variation is a polymer aluminum electrolytic capacitor that can replace conventional tantalum capacitors and is available in smaller sizes and larger capacities. Another variation is a film capacitor that uses organic material for dielectrics, and this capacitor which is currently under development is unique in that it can be used even at high temperatures exceeding 100°C. Silicon capacitors are not only smaller and thinner, but can also be used at high temperatures, so they have the added value compatible with unique specifications required in the automotive and medical fields.

In addition to capacitors, inductors and EMI suppression filters for automobiles are also gaining momentum. Higher currents produce wider ranges of noise, and the high frequency of 5G technology will generate a range that is different from conventional noise. It will be essential to strengthen measures to handle this factor. Murata provides noise diagnoses to customers from electromagnetic anechoic chambers constructed in locations around the world, and creates a cycle in which information about noise obtained therefrom is utilized in new product development.

In the automotive market, our most important market together with communications, whereas we previously satisfied customer needs by screening consumer products such as smartphones and providing partial changes to designs, we are now focusing on fully reexamining the required specifications for automobiles from step one as we move into development.

Increase market share for automobiles and further improve production efficiency

Murata’s financial performance in recent years has been steadily expanding. However, it was necessary to increase capital expenditures and accumulate a stockpile of products to meet demand fluctuations

as a result of the fact that a large percentage of sales were dependent on a specific market in this process, and this factor presented a risk.

Balanced business development that does not concentrate heavily on a specific market is necessary in responding to this issue. As such, we must reconsider both our customer mix and our market mix in order to increase our share in the automotive market in addition to the communications market, and develop a production plan that maximizes the operating rates of facilities.

Meanwhile, we must ask ourselves how much we can raise our production efficiency in response to further increases in demand. We are currently developing a smart factory concept that employs MLCCs to address this situation, and are making drastic improvements in operations, all the way from input instructions to monozukuri (manufacturing) and shipping.

Of course, our human resources are the foundation for these initiatives. We believe that Murata’s greatest strength is that each and every one of our employees is diligent and attentive in their work, down to the smallest details. For example, it is natural for any one of our employees to think about how many years it will take to recover the funds when considering a capital expenditure. In addition to the results of corporate climate reforms that we have implemented over the past 10 years, we have cultivated a culture where our employees can express opinions that extend beyond the boundaries of our business, and have steadily nurtured a consciousness for taking on new challenges. We are dedicated to achieving a renewed recognition of our unique strengths and capturing new business opportunities in “5G,” and “EVs, V2X, and autonomous driving.”



Director of
Module
Business Unit

Senior Executive
Vice President

Norio Nakajima



As we enter the 5G era, we will further refine Murata's strengths.

The arrival of the 5G era will bring new sources of added value

Today, we are on the verge of major changes and business opportunities, the likes of which have never been seen before. First, there is the arrival of the "5G era," which will see service launched in countries around the world between this year and next year. There is also the "automobile evolution," including automated driving and connected cars.

The characteristics of 5G are "ultra-high speed and large capacity, low latency, and multiple concurrent connections," of which "low latency" is particularly notable. In a low latency environment, it will become possible to send data to the cloud instantaneously, and receive the results of various processed tasks in real-time. In other words, the burden on the device side will be reduced, so we will probably see the emergence of edge devices, structured in a simple way to suit applications without being restricted by the form of devices like smartphones.

This will naturally affect our business model, which is based on developing and selling out modules for smartphones and other specific industries. In the 5G era, I think that the scope of our customers will expand to include industries that we have not traditionally traded with, and we may expect recurring revenue-type business opportunities with more added value, which can continuously generate revenues even after sales

have been made. It is also important that we respond to the "automobile evolution," and I think the communication module technologies that we have developed thus far will be utilized in areas such as navigation and collision prevention radar. We must focus on developing products that are more reliable, from the selection of materials to the durability of their structure.

Murata's technological capabilities being utilized precisely because of the high barriers in the high frequency environment

The arrival of the 5G era is an excellent opportunity for us to further develop our strengths and identify new added value. Murata is already developing communication modules equipped with all the functions required by 5G, specifically modules that incorporate small L-shaped antennas, filters, power amplifiers, and transceivers. These products are notable for using the multilayer resin substrate "MetroCirc™," which facilitates a flexible bending process for L-shaped parts. The millimeter waves used by 5G move in a very straight line, so four modules are required to transmit radio waves in all directions with existing substrates, whereas this MetroCirc™ enables coverage using two modules. Furthermore, a strength of the LCP (liquid

crystal polymer) used in MetroCirc™ is that it is made with special materials that limit radio wave loss to low levels, even for high frequencies. As the radio wave frequencies used in 5G become higher in the future, we will be able to further differentiate ourselves from competitors with this technology.

The "I.H.P. SAW filter" is one product that will enable us to clearly differentiate ourselves from competitors in the 5G era. Murata holds a 50% share of the global market for SAW filters, which are used for selecting specific frequencies. The "I.H.P. SAW filter" is small and low-cost, while also acting as a steep and low-loss filter for high frequency waves, which was previously difficult to achieve.

As edge devices made in a variety of ways emerge in the future, the technology that Murata has developed in pursuit of high performance in a miniature form will increasingly demonstrate its strength. It is difficult to predict what kind of edge devices will be popular in the market, but we believe there may be an increased range of business opportunities as our unique product development system, in which development and manufacturing are used to support our priority of product technologies where product design is determined by identifying customer needs, becomes a strength.

Implementing multifaceted portfolio management from a medium- to long-term perspective

The overreliance on specific markets will be an issue in our Modules segment. There are only two ways to resolve this issue: reduce our reliance on these markets, or clearly differentiate our technologies from those of competitors. At Murata, we are implementing portfolio management that focuses on areas where growth is expected in the future, namely communications, automobiles, IoT, and energy, whereby developing core technologies and products based on a medium- to long-term perspective.

In terms of specific areas, even in the battery business, which has been struggling somewhat, demand for cylindrical cells, for example, is increasing for applications in areas such as power tools, which are increasingly becoming cordless, and gardening tools, which are moving from gasoline engines to electric power sources. There is also stable demand for micro batteries, which are

very economical, robust, and safe, for applications in areas such as medical devices and healthcare equipment, in addition to in-vehicle applications.

In the future, we can expect to see the emergence of the favored form of next-generation battery, fully solid state batteries, which are very heat-resistant and safe. Murata's advantage in regard to fully solid state batteries lies in the utilization of our multilayer technology, developed for MLCCs (multilayer ceramic capacitors). At present, the energy density of solid state batteries is lower than lithium-ion batteries, so first we would like to increase our share of the market for wearable devices, which consume a small amount of power.

On the other hand, we are also strengthening our energy-related products, which are centered on batteries. Our energy management systems, which we are now supplying for general household use, are safe and long-lasting module products that are expected to contribute to in-house consumption of electricity, an area where demand is likely to increase in line with the end of the feed-in tariff system for solar power generation.

In order to achieve our unchanging mission to be an "Innovator in Electronics" with a product line-up suited to the demands of the times, we will keep our feet on the ground as we continue focusing on developing original technologies and products.

