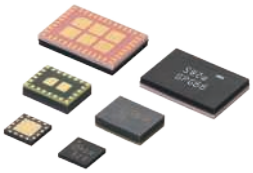
Modules

RF modules

(New segment of net sales classification: High frequency devices and communications modules)



RF modules are multifunctional and high-performance electronic component units that realize an analogue high-frequency circuit that controls communications among wireless devices by integrating various key devices in a small package. This module is comprised of passive devices such as SAW filters and LC filters that distinguish RF, filter out noise and pick up required signals, high-power amplifiers (PA) in transmission circuits, low-noise amplifiers (LNA) in reception circuits, antenna changeover switches (Switch) and other semiconductor devices. RF modules are used for various types of wireless devices including smartphones and tablet PCs.

Murata internally develops various key devices that form the basis for module configuration and package technologies for modularization. Since the early 2000s, Murata's technologies for passive devices such as SAW filters and LC filters and unique packaging technologies for LTCC substrate have been leading the RF module business. As for semiconductor devices such as PA, LNA and Switch, Murata acquired the PA business of Renesas Electronics Corporation and pSemi (formerly Peregrine Semiconductor) and integrated their technologies with passive devices and packaging technologies that have been Murata's strengths, thereby expanding the RF module business.

Murata, which internally develops these key devices, is able to carry out integrated production. As a result, Murata maintains a strong competitive advantage in terms of production capability and quality, in addition to performance. Furthermore, with a global sales network and technical support system, Murata promptly identifies market and customer needs and reflects such in product development in a timely manner, which gives Murata an advantage in application-specific RF module business.

With the arrival of 5G, which enables "high-speed, large-capacity communication," "multiple concurrent connection communication" and "low-latency real-time communication," RF modules for realizing further high frequency, expansion of frequency bands and dual connectivity, in addition to multiple frequency bands and carrier aggregation for communications systems up to 4G, will become necessary. In addition, the modularization of electronic components is expected to advance in line with the miniaturization and increased functionalities of wireless devices.

It is expected that the unique benefits of 5G are to promote the diversification of IoT devices and bring many conveniences to life and work. We consider that the expansion of IoT devices will expand business opportunities not only with customers specializing in the communications market, such as smartphones and tablet PCs, but also with customers in new markets that we have not been involved with before.

In the 6G era, which is also called Beyond 5G, "ultra-low power consumption" and "ultra-reliable communication" are required. In order to survive in the global competition, we will continue to strengthen our "high technological capabilities" and "high-quality monozukuri (manufacturing)" that Murata has cultivated over the years. Murata will contribute to customers by promptly identifying future market and customer needs, while also leveraging our competitive advantages to propose RF modules most suitable to customers.

Business opportunities

- Expansion of frequency bands, advancement of communications technologies driven by growing adoption of 5G
- Modularization and miniaturization of electronic components

Strengths

- In-house production of key devices and packaging technologies
- Identification of customer trends and capability to propose products utilizing sales and technical support network
- Business speed, reliable quality and stable supply enabled by integrated production

Competitors

Skyworks Solutions (U.S.), Qorvo (U.S.), Qualcomm (U.S.), Broadcom (U.S.), etc.

Risks

- Potential moves by customers and component suppliers due to changes in U.S.-China relations
- Entry of low-cost module manufacturers into the market

Modules

Connectivity modules

(New segment of net sales classification: High frequency devices and communications modules)

Connectivity modules are essential compound components that wirelessly connect various devices. These are mounted on familiar home appliances used in our daily lives, such as smartphones, tablet PCs, digital cameras and air conditioners, in-vehicle devices such as car navigation systems, and in various settings such that they enable users to download and upload photos and music from the Internet, and perform hands-free calling while driving.

In the communications market, with the rapid progress of the IoT society where all types of objects around us are connected to the Internet, new wireless communication standards such as Wi-Fi® 11ax, Cellular LPWA (Low Power Wide Area), UWB (Ultra Wide Band) and millimeter waves are also expected to spread. In the automotive market, along with the growing adoption and progress of wireless communication functions, use for in-vehicle detection is also increasing utilizing V2X Communication that connects with infrastructure and radar technology.

For 5G in millimeter wave bands, Murata can provide communication modules with low transmission loss utilizing composite technology which integrates proprietary multilayer resin substrates, high-performance IC and antennas. Countries around the world are now planning to provide communications services using millimeter wave bands, and started discussion regarding Beyond 5G (6G) standards. In a world in which everything can be connected through higher-speed communications, the use of connectivity modules is expected to expand further.

The growth of smartphones, which has been significantly rapid so far, is expected to slow down in the future. At the same time, competition among competitors is intensifying. Under such circumstance, Murata's connectivity modules continue to provide products and value in response to various changes, such as 5G, new communication standards, and use of wireless technology in the areas other than data communication, by taking advantage of our strengths including proprietary multilayer resin substrates technology, design technologies to realize compactness, higher performance and high reliability, and software technologies to enhance connectivity. Murata strives to build a partnership with customers to be their first choice. In addition, Murata strives to contribute to the resolution of social issues and reduction of environmental burden by proposing appropriate products in diversified business opportunities such as environment and wellness.

Business opportunities

- Growing adoption of 5G
- Full-fledged consideration of Beyond 5G
- Due to the development of an IoT society, automobiles and various types of devices will have wireless communication functions

Strengths

- Millimeter wave modules using Murata's unique multilayer resin substrates
- Technologies that enable miniaturization and high performance as well as ensure reliability
- Software technologies that improve connectivity

Competitors

JCET (China), USI (China), Quectel Wireless Solutions (China), LG Innotek (South Korea), ALPS ALPINE (Japan), etc.

Risks

- Intensified competition among competitors

Modules

Multilayer resin substrates (MetroCirc)

(New segment of net sales classification: High frequency devices and communications modules)

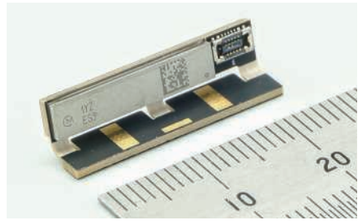
MetroCirc is a thinner multilayer resin substrate comprising LCP (liquid crystal polymer) sheets. It features exceptional RF characteristics and realizes a substrate with a stable performance due to extremely low water absorption. It is also characterized by the ability to handle a flexible bending process because it does not require an adhesive layer. In addition, high multiple layers are possible by using Murata's multilayer technology, enabling high flexibility in design. It is possible to design circuits by inserting copper foil sheets between LCP sheets, and these circuits are used as transmission wires, coils, and other functional components in smartphones, wearable devices, and other applications, contributing to smaller, thinner, and higher performance devices with low energy consumption.

Millimeter waves over 40 GHz and other extremely high-frequency waves are used in the growing 5G network, so MetroCirc is increasingly used in millimeter wave transmission lines, as they can take advantage of the low-transmission loss properties at extremely high frequencies, one of the features of MetroCirc. In addition, we believe that there will be more opportunities for a wide range of customers to favor MetroCirc in the future as the frequencies used become higher, because this will further highlight MetroCirc's competitive superiority in terms of transmission loss compared with competing technologies, and we believe that we can take the lead even in an increasingly competitive environment.

Taking advantage of the high-frequency features and high multi layers, it is increasingly adopted in module substrates. As for millimeter wave modules, MetroCirc enables two directional antennas by making an L shape, contributing to enhancing the competitiveness of modules. Looking ahead, customers will face more issues related to high-frequency communications as the number of devices using 5G increases; however, by using MetroCirc, we can make a variety of proposals depending on customers' designs and issues.

In addition, because LCP is a material with exceptionally low water absorption, it is highly stable for uses such as antennas, which utilizes resonance. Now that smartphones have UWB (Ultra Wide Band) and in some cases are used in digital key authentication utilizing its highly accurate positioning and measurement of distance, the market is expected to expand. MetroCirc has frequency stability and is suitable for UWB antennas.

We will further contribute to resolving customers' issues, through the combination of high-performance materials and Murata's unique ideas, developed based on our multilayer technology and high-frequency technology.



MetroCirc used in substrates for millimeter wave modules

Business opportunities

- Expansion of the high-frequency communications market as represented by 5G
- Resolution of customers' issues by utilizing the characteristics of MetroCirc, such as low water absorption and shape retention property

Strengths

- Low transmission loss properties at high frequencies
- Flexibility that can handle complex bending process
- High multi layers, low water absorption

Competitors

ZDT (Taiwan), Flexium Interconnect (Taiwan), etc.

Risks

- Intensified competition
- Changes in the demand due to changes in customers' design